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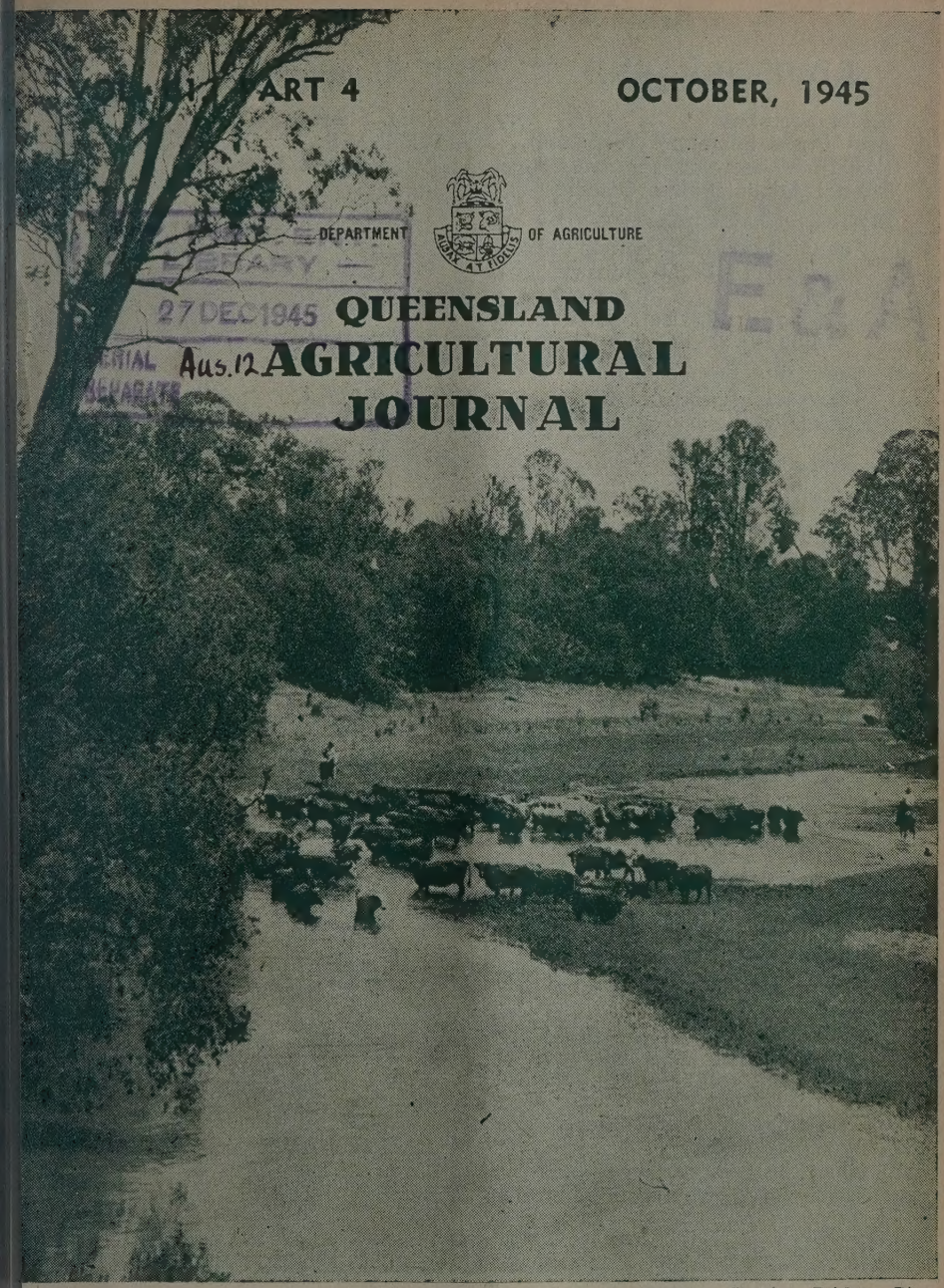

Wivenhoe Crossing, Brisbane River.

LEADING FEATURES

Pineapple Plant Selection
Crop and Pasture Trials
A New Insecticide—D.D.T.
Insect Pests of Grain Sorghum
Surgical Shock and Poisoning Following Lamb Marking
Milk Cooling on Darling Downs Farms

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Contents

Event and Comment— PAGE.
- Queensland, a Great State 195
- Food Comes First 195

Field Crops—
- Crop and Pasture Trials on the Darling Downs 197

Fruit Culture—
- Pineapple Plant Selection, with Special Reference to the Elimination of Inferior Types 203

Plant Protection—
- A New Insecticide—D.D.T. 216
- Insect Pests of Grain Sorghum .. 221

Answers to Correspondents—
- Scrub or Mountain Pandanus .. 232
- Poa Aquatica. Panicum Muticum .. 232
- "Strychnine Bush" 232

Sheep and Wool—
- Surgical Shock and Acute Blood Poisoning Following Lamb Marking 233
- Culling the Flock 236

The Dairy Industry—
- Milk Cooling on Darling Downs Farms 237
- Threshed Peanut Hay for Dairy Cows 245
- Production Recording 246

General Notes— PAGE.
- Staff Changes and Appointments .. 248
- Plague Grasshoppers 248
- Introduction of Mandarins—A Precautionary Measure 248
- Seeds Regulations 248
- Rationed Poultry Foods 248

Rural Topics—
- The Country Women of Queensland 249
- Food Comes First 249
- A Word for the Working Dog 249
- Quality for Export 250
- On Buying a Dairy Herd 250
- "Strawberry's" Win 250

Gadgets and Wrinkles—
- Milk Cans Cooled by Water 251
- Air Cleaners and Tractors 251
- Re-using Baling Wire 251

The Farm Home—
- Summer Clothes for the Toddler .. 252
- Fritters and Pancakes 253

Astronomical Data for Queensland .. 254

Queensland Weather in September .. 255

Rainfall in the Agricultural Districts .. 256

Climatological Table for August .. 256

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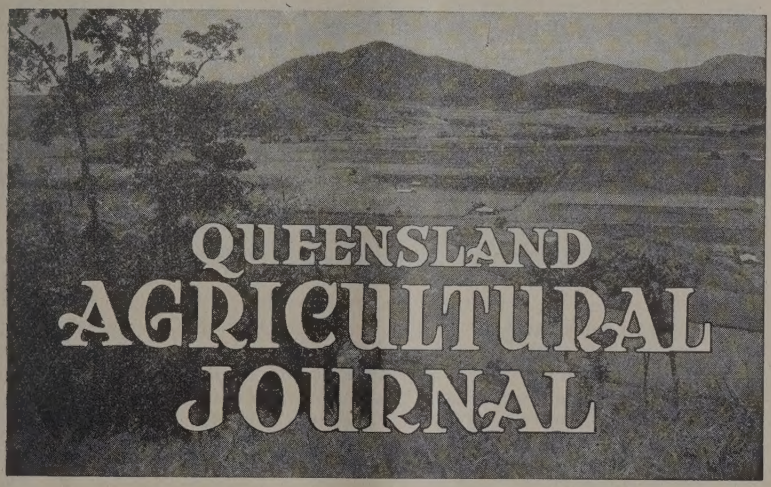

Volume 61 | 1 OCTOBER, 1945 | Part 4

Event and Comment.

Queensland, a Great State.

"QUEENSLAND is a great State with a great future, and nothing can stop its development," said the Governor, Sir Leslie Orme Wilson, in opening the Annual Conference of the Queensland Council of Agriculture. Development may be delayed, His Excellency added, and the Council would do very good work if it expedited that development. Peace would bring some tremendous problems to solve, and agricultural problems would not be the least difficult. For the past fourteen years he had been in close contact with agriculture in Queensland, and he realised the difficulties to be faced. The Council could help by developing primary industries, fostering farmers' co-operative enterprise, controlling marketing to effect stabilization of prices of primary produce, and acting as liaison between the Government and other authorities and the producers. Continuing, the Governor said that if agricultural industries were to be developed in the far distant parts of Queensland the people must be given the amenities to which civilised people were entitled. He stressed the value of irrigation and urged the establishment of more experimental farms for the development of sub-tropical crops, such as cotton and tobacco.

Food Comes First.

IN the course of his presidential address at the Annual Conference of the Council of Agriculture, the Minister for Agriculture and Stock, Mr. T. L. Williams, emphasised that the present need for essential foodstuffs is just as great as it was during the war, and that for some time to come there will be a strong demand for most of Australia's exportable surplus primary produce. The agreements entered into with Great Britain had assured a continuation of price stability for export

dairy produce, eggs, and meat products for some time ahead. This would afford these industries an opportunity to prepare to meet the attempt which could be expected from some quarters for a return to the lower pre-war price levels when these arrangements terminate.

On numerous occasions he had stressed the fact that cheap food had been the traditional policy of major industrial nations and that it is this policy which had kept agriculture on the dole. During the war, however, a system of food production subsidies had been evolved which assured higher prices to producers without corresponding increases in cost to consumers, but how long this would be allowed to continue remained to be seen.

Subsidies as they now operated left much to be desired, the Minister continued, and producers no doubt would prefer to see their industries placed on a sounder economic basis as there was a lack of assurance of continuity about this system. It would be foolish, however, to dispense with something which, despite any weaknesses it may have, had given the farmer a greater measure of stability than he had ever before enjoyed, until such time as something better was offering. It was refreshing to note a growing appreciation throughout the world of the importance of agriculture and the need to place it on a more secure basis.

Australia had become a member of the United Nations Food and Agriculture Organisation, which had as its aims the raising of levels of nutrition and standards of living of all peoples; the securing of improvements in the efficiency of the production and distribution of all food and agricultural products; the bettering of the conditions of rural populations; and thus contributing towards an expanding world economy.

Australian producers would watch with interest the work of this organisation which it was hoped would not only endeavour to bring about an improvement in living standards, but would also be in a position to promote scientific, technical, social, and economic research into matters relating to nutrition, food and agriculture.

Mr. Williams added that the success of such an organisation would depend largely on the co-operation which it received from the associated Governments. Any improvement in world standards of consumption of food and agricultural products which the organisation might be able to achieve should be of immense value to Australia, which had always been dependent on export markets for the sale of its surplus primary products. With the further development of our land resources which was sure to follow the return to peace, it was only reasonable to assume that an outlet would have to be found for an ever increasing volume of production.

In the past, primary producers had too often been required to accept prices for their commodities far below cost of production, and unless some action along the lines suggested by the formation of this World Food and Agricultural Organisation was forthcoming, a return to those unsatisfactory conditions, with consequent disastrous results not only to agriculturists but to the people generally, seemed inevitable

The establishment of this organisation was, in Mr. Williams' belief, an honest attempt to place agriculture on a more stable and higher plane, and was therefore deserving of the support of the primary producers of all countries.

Crop and Pasture Trials on the Darling Downs.

C. S. CLYDESDALE, Senior Adviser in Agriculture, Toowoomba.

RAINFALL conditions during the 1944-45 period were the best which have been experienced for many years past, the amount received and the distribution being very satisfactory, except for a dry period during mid-summer. Wheat and other winter crops benefited considerably from excellent falls in July of 1944, and again in August and September. Light follow-up rains were experienced during October, while the dry weather which prevailed throughout November provided ideal wheat-harvesting conditions. December and January were very dry and summer crops received a setback during this period, but 1945 winter crops, apart from wheat, were planted on March rains and made excellent progress during the months of April and May, during which temperatures were quite mild. A very wet June caused some local floodings and resulted in damage to crops.

Apart from the midsummer period of dry weather, pasturage was in excellent condition throughout the twelve months. A very wide variety of grasses was present in profusion. The introduced annual Urochloa grass, which is widely spread on the Darling Downs, germinated readily on the October rains but hot conditions in November caused the death of much of the seedling growth. However, a second flush of germination occurred later and thick stands resulted, particularly on the lighter soils. This grass, which a few years ago had a very restricted distribution, was recently observed as far west as Taroom. Red Flinders grass made further progress during the 1944-45 season in the Yandilla and Brookstead districts, but its spread is not as rapid as that of Urochloa grass.

Departmental Activities.

In addition to a great deal of instructional and District War Agricultural Committee activities, a fairly large volume of investigational work was carried out on the Downs. Apart from introduced pasture plants, the following crops were embraced in the experimental work:—wheat, oats, linseed, sweet potatoes, soy bean, Sudan grass, navy bean, and saccharine sorghum.

Plate 107.

UNLOADING BAGGED WHEAT FROM AUTO-HEADERS.—A very high percentage of the Queensland wheat crop is from varieties bred by the Department of Agriculture and Stock.

Wheat.

Propagation plots of various new crossbred wheats were supervised during 1944 at Oakey and Dalby.

The variety grown at Oakey was Florence x College 3606. This is slow-maturing, is very rust-resistant, has a good straw and even growth, and yields heavily.

At Dalby, three varieties were put out in propagation plots—viz., Florence x College 3813, T.S. x Flo. x K.6041-3911, and T.S. 3401 x Flo. x K.6041-4101. All varieties showed good promise, despite the fact that dry conditions prevailed on the farm from planting

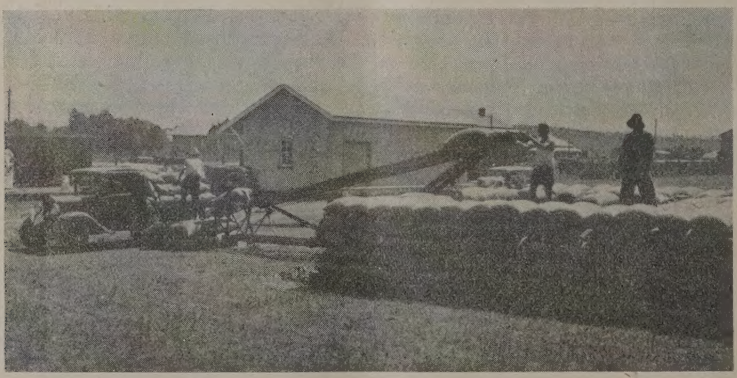

Plate 108.

BUILDING A WHEAT DUMP AT A RAILWAY SIDING.—The State Wheat Board holds much of the crop in district dumps pending despatch to millers and other users.

at the end of May until the middle of September. The second-named variety was estimated to have given the highest yield. This is a bearded variety with a strong straw. The next highest yield was given by the third variety, but this has been shown by the Pelschenke test to be definitely weak in quality. Florence x College 3813 yielded satisfactorily.

Assistance was given to the State Wheat Board in the inspection of grain crops for seed purposes. As there is no large-scale commercial production of pure seed in Queensland this scheme has much to commend it, and it is encouraging to note that growers are co-operating by rogueing their crops before inspection is made.

Breeding work with wheat, oats, and cowpeas was carried on during the year by the officer in charge of that work.

Plate 109.

A Darling Downs Crop of Sunrise Oats.—Most of the oat crop is used for grazing and green feed purposes.

Oats.

An oat varietal trial was conducted at Kincora during 1944, planting being carried out in early June. Weed appeared in the crop at an early stage, necessitating harrowing when the oats were from 4 to 6 in. high.

Sheep were grazed on the experimental plots during July. Preference was shown for the variety Klein, which was eaten before the Fulghum x Victoria Cross was touched. Recovery from grazing was unsatisfactory, owing to the seasonal conditions. Klein reached a height of only 2 ft.; stooling was only fair; stalk and flag were very fine; little or no rust appeared. Fulghum x Victoria grew to a height of 3 ft. 6 in., with a much stronger habit of growth than Klein; stalk and flag were inclined to coarseness, but stooling was fair to good; no rust appeared.

After the crop reached the shot-blade stage, hot, dry conditions prevailed and had the effect of haying-off the crop. Klein was particularly affected and much of the seed of this variety was very thin and light and some shelling occurred.

The plots were rogued on several occasions. Harvesting in November yielded 60 lb. of Klein seed and 11 bushels of seed of Fulghum x Victoria.

Linseed.

A varietial trial and seed increase plots of grain types of linseed were put down in the winter of 1945 at Westbrook. The varieties sown were—Abyssinian, Amebori, Bolley Golden, Ghahrch, Malabrigo, Morocco, Punjab, Rio, Walsh, 53-1.

Sweet Potatoes.

A number of propagation plots of named sweet potato varieties have been maintained with the object of interesting farmers in the production of sweet potatoes of known type. Cuttings are available to farmers, but to date the demand has not been very great.

Soy Bean.

Plans were made for the laying-down of a soy bean varietal trial at Westbrook during the summer of 1944-45. Unfortunately, the dry conditions of November and December prevented early planting; hot, dry conditions following sowing in early January resulted in a very poor germination, which caused the experiment to be abandoned for the season.

Sudan Grass.

For some years past the Department has been interested in the propagation of pure seed of Sudan grass, in order to make available to growers seed which has not been contaminated by Johnson grass and other members of the sorghum group. A line of seed produced at Drillham was planted at Pittsworth during the 1944-45 summer. Some rogueing was carried out during the growth of the crop and harvesting was effected in May.

Navy Bean.

The increased interest which has been taken in the cultivation of navy beans on the Darling Downs during recent years has necessitated variety trials with the object of sorting out the best varieties for each district. A trial incorporating eight varieties—Great Northern, Pinto, Asada Pearl, Ohtenashi, Canadian, Navy, Californian Small White, and Michelite—was carried out at Maryvale. Californian Small White, Navy, and Canadian were the highest yielders, with Ohtenashi, Michelite, and Asada Pearl well down. Despite its fairly low yield in this experiment, Michelite is a promising variety.

Saccharine Sorghum.

A small plot of a saccharine sorghum variety with a high reputation in South Africa—the variety Haakdoorn—was sown at Toowoomba for observation purposes. The seed was not received sufficiently early to enable a seed-increase plot to be established under isolation conditions.

The habit of growth is similar to that of Saccaline, the stalks being of medium thickness and the flag of medium width. A height of 8 ft. 6 in. was reached. The stalks contain a fair amount of sugar juice, but the heads are susceptible to smut infection.

Plate 110.

HARVESTING A CROP OF SACCHARINE SORGHUM.—This crop is grown to a large extent for green feed and silage.

The Department is interested in building-up seed supplies of the Italian variety of sweet sorghum, which is popular for feeding purposes on the Darling Downs. Weather conditions during November and December rendered it advisable to postpone for the season the laying-down of a propagation plot which had been planned for the Milmerran district.

Grain Sorghums.

During the season, several crops were inspected for seed purposes. There is a particularly good market for pure seed, and many farmers are now specialising in the production of high-grade sorghum seed. The most popular varieties are Hegari, Wheatland Milo, Kalo, and Day Milo. The growing popularity of Hegari may be due to the stalk being more palatable to stock than that of other varieties.

Tobacco.

An advisory service to tobacco-growers was maintained during the year, but owing to staff shortages no experimental work was carried out.

On most farms conditions during the early part of the season were satisfactory and a large proportion of the crop was in the field by the end of October. Prior to October no trouble from blue mould was experienced in seedbeds, but later seedbed work required the use of benzol. Mould was very prevalent in the field until January and caused a good deal of damage to leaf.

Shortage of water supplies caused concern on some holdings in January, but storm rains fell before restrictions on the use of water from streams were necessary.

Cyclonic winds and hail in January caused losses as high as 50 per cent. Crops which had been irrigated just prior to the winds were flattened, but by co-operative effort the plants on a number of properties were picked up and losses were negligible. Hail damage to some of the more advanced crops necessitated removal of the leaf.

Of insect pests, thrips was particularly widespread and caused serious damage to some crops. One peculiarity of the attacks of this insect was that while damage on one farm was serious, that on an adjacent farm was little. Leaf miner and stem borer caused some concern early in the season.

The varieties in general use in the south-western tobacco-growing districts are Wyemo, Mammoth Gold, Gold Dollar, Yellow Pryor, Cash, and Kelly. Estimated yield for the season was 215¾ tons, or an average of 754 lb. per acre.

Pasture and Green Manure Legumes.

Observational plots of a number of introduced and native legumes were put down at Westbrook and Toowoomba. The species sown included pigeon pea, phasemy bean, *Centrosema pubescens*, *Calopogonium mucunoides*, *Rhynchosia minima*, *Glycine tabacina*, *Vigna lanceolata*, *Vigna luteola*, *Cyamopxis, psoraloides*, *Desmodium campylocaulon*, and dolichos bean. Some of these showed promise during their first season of trial.

LEAVE IT TO THE RESEARCH WORKERS.

Every so often, someone writes about or talks with assumed authority of some plant (described in a pamphlet or a digest picked up somewhere), which is going to replace established crops or take all the kinks out of pasture management. Glowing reports soon stimulate the innate curiosity of the born farm reformer, or the self-elected experimentalist, whose enthusiasm may be, perhaps, keener than his commonsense. By hook or by crook he must get seed of the new wonder plant to try it out, and he does, so often to our sorrow. That is how we got many imported vegetable pests into Australia—skeleton weed, to name one horrible example.

The thing to be remembered always, if tempted to do some free-lance experimenting, is that there are Departments of Agriculture and many research stations and other institutions in Australia which are kept fully informed, through various channels, of developments in the plant industry of every country. On the staffs of these institutions are plenty of trained men ready and willing and able to do all the experimenting that may be required. They are aware of the capabilities of any particular economic plant in its country of origin, but it is obvious that the same plant may not do so well under entirely different conditions or environment of soil and climate.

In any case, the complete testing of new plants is not a matter for the farmer himself, for experimental work cannot be cheaply undertaken. The farmer, usually, has neither the time nor the cash to carry it out. Not only that, everything about a particular species of plant must be investigated before a general approval can be given. Then there is the real risk of introducing and spreading an undesirable plant.

If a particular plant has any value, or special virtue, the research workers will soon make it known. So the trying out of new plants can be very well left to the men who are trained for the job and whose findings can be accepted with every confidence.

Pineapple Plant Selection, with Special Reference to the Elimination of Inferior Types.

H. M. GROSZMANN, Assistant Horticulturist.

THE use of inferior plants as sources of planting material occasions considerable loss to Queensland pineapple growers. The extent of this loss is not readily apparent, however, as it is spread over large areas and occurs over long periods. The result is that the majority of growers do not practise selection of planting material, either because they do not realise the necessity for plant selection, or because they under-estimate the extent of the loss, regarding it as too slight to warrant the tedious work of selection.

It is proposed to explain in this article what is meant by the term "inferior plants," and to describe suitable methods for reducing their numbers in the plantation.

Causes of Inferiority.

Inferior plants fall into two classes. Firstly, there are plants from quite normal stock which have developed some defect owing to poor growing conditions. Secondly, there are plants from inherently defective strains, and they and their progeny remain inferior regardless of what treatment they receive.

Planting material from plants which have been weakened by poor growing conditions will tend to make inferior growth as compared with that of material from vigorous plants of the same stock, and it should be avoided where vigorous plants can be obtained. If, however, such weak plants are grown under good conditions for a few generations they will return to normal. This is not the case with plants from inherently inferior strains, which, as stated above, will continue to be inferior no matter how favourable the environment. While it is unwise to use any weak plants for planting material, it is with plants of inherent inferiority that this article is chiefly concerned, as these alone cause permanent deterioration in the stock.

Emphasis has been placed on the importance of avoiding inferior strains in order to maintain the stock, as this is regarded as the most pressing aspect of the problem and the one that offers the greatest prospect of rapid improvement in fields where the stock has deteriorated; but it must be pointed out that, just as there are strains definitely inferior to the original stock, so there may be distinctly superior strains.

The culling out of the poorer types is necessary to maintain the original stock, while the selection and propagation of the latter strains is a possible means of improvement.

Pineapple Strains and Their Origin.

It is necessary to explain what is meant by "strains" of pineapple, how they originated, and how to recognise them. In plants, such as the Smooth Cayenne pineapple, which are reproduced by vegetative means —that is, by a plant part such as a sucker, a cutting, or an offshoot of any kind, as distinct from seed—it is the rule that the progeny closely resemble the parent and belong to the same variety. While this is true in the vast majority of cases, occasionally it happens that a change of an hereditary nature occurs in the tissues of a plant such that plants arising from buds in this altered region of the parent are different in nature from the original stock and their progeny continue to be different, thus constituting a new strain. Such an hereditary change is termed a "sport" or "mutation."

Plate 111.

WINTER TYPE OF SMOOTH CAYENNE PINEAPPLE.—Note the conical shape of the fruit and the small crown.

Selection to Remove Accumulation of Inferior Types and Subsequently to Maintain the Stock.

As sports occur only rarely, selection will cause a rapid and lasting improvement in plantations where, through previous carelessness or lack of knowledge, inferior strains have been allowed to multiply over a long period of years. Nevertheless, the grower must be continually on the watch and cull out the poorer sports as they appear.

There is another reason why it is unlikely that one selection will eliminate inferior types. This is found in the fact that many sports

or mutant plants do not consist entirely of mutant tissue but are really patchwork or variegated combinations of normal and mutant tissues and probably appear normal unless there is sufficient mutant tissue present to show its variegated character. This presence of different tissues is evident when the new characteristic is visible throughout the plant as a colour change, giving a patchwork or variegated effect, but it is probably true also of many other sports. It is not intended to go into the details of this theory, which helps to explain the otherwise odd occurrence of normal plants in the progeny of very abnormal mutants and also why inferior plants sometimes are found in fields raised from selected material.

In any pineapple plantation, marked differences in plant and fruit type occur from plant to plant and from season to season. Most growers are familiar with the different types of fruit harvested during the summer and winter crops—the large, tapered winter fruit with small crown (Plate 111), and the smaller, smooth-eyed, square-shouldered

Plate 112.

SUMMER TYPE OF SMOOTH CAYENNE PINEAPPLE.—Note the large crown.

summer fruit with large crown (Plate 112)—and throughout any field during the one crop the plants will be found to vary considerably with regard to characteristics such as fruit shape and size, number and size of slips, suckers and crowns, time of fruiting, and many other features. Most of these are simply environmental modifications of the one plant strain and growers recognise many of them as such; but some are mutations and it is important to distinguish between modifications, which are not inherited, and mutations, which are. The test is to grow plants from the abnormal types under observation, when plants from the mutant types will reproduce the same abnormality, while those from the environmental modifications—such for example as the "prickly-eyed" or "Christmas" pineapple—will not.

Important and Unimportant Mutations.

Numerous abnormal plant types from Queensland plantations have been tested to discover the nature of the abnormality and over twenty mutant types have been discovered. Of these, however, only a few are important. To cause any considerable loss, an abnormal strain must be not only inferior but also prolific in planting material. A marked defect associated with few or very weak offshoots is not nearly so important as a slight defect in a type which multiplies rapidly, and it is possible here that slight physiological defects which are not easily detected but which may result in a slight reduction in plant vigour and productivity may be very important. The grower is therefore advised when selecting plants to avoid all obviously defective mutants and also to avoid plants which are not vigorous and healthy, thereby eliminating some constitutional defects which are not otherwise distinctive.

While it is necessary to cull out any defective strains, there are three inferior types that deserve particular attention. These are the "collar-of-slips," the "long Tom" and the "dry-fruit" strains.

Plate 113.

"Collar-of-slips" Abnormality.—This sectional view shows the slips originating from the base of the fruit.

"Collar-of-Slips" Abnormality.

The collar-of-slips type (Plate 113) is distinguished by the presence of slips arising from the base of the fruit itself. Usually, however, but not invariably, there is an excessive number of slips, not all of which arise from the base of the fruit. Furthermore, the fruit, which often carries knobs at the base as well as slips, is often small and tapered at the top. Suckering is generally greatly retarded. Removal of the slips during harvesting is troublesome and tearing of tissues may lead to leaking of the fruit. The collar-of-slips type is consequently very objectionable.

Plate 114.

"Near Collar-of-slips" Abnormality.—The view shows that the slips arise close to but not directly from the base of the fruit.

In the progeny of collar-of-slips plants occur not only the true collar type but also three others, viz., "near collar," "knobby," and "apparently normal" types. In the near-collar type (Plate 114) slips are numerous and clustered around the base of the fruit, but do not originate from the fruit itself. The knobby fruit may be quite normal as regards production of slips, but knobs varying in number and size

Plate 115.
Torn and Distorted Bracts of the Collar-of-slips and Near Collar-of-slips Type.

Plate 116.
A Type Similar to the Near Collar of slips Type.—The slips are slightly lower in origin and there is no distortion of the bracts.

are produced at the base of the fruit. It is possible that these types represent a gradation from plants with a high percentage of collar-of-slips tissue to plants with a low percentage, and as such they should be avoided if the maximum reduction of collar-of-slips plants is the objective. This gradation has still to be tested by growing the progeny from collar-of-slips plants for several generations.

It has been noticed, however, that knobby fruit are very prevalent, particularly in good summer plant crops, and planting material from such plants has yielded so few collar-of-slips that it is considered wasteful to discard planting material from these plants.

The near-collar and true collar types are often indistinguishable until the fruit is picked. Frequently a vigorous plant of the normal strain bears six to eight slips fairly close to the fruit. This can be easily confused with the near-collar plant, but generally the slips are neither so numerous nor so near to the fruit as is the case with the near-collar. With the near-collar and true-collar plants the slips arise so close to the base of the fruit as to break the bracts (Plate 115) at the top of the fruit stalk. With the vigorous plants mentioned above the slips are a little lower, so that the bracts remain intact (Plate 116), as may be seen when the fruit is picked. Planting material from such types has yielded very few collar-of-slips.

In attempting to eliminate collar-of-slips, the allied near-collar plants also should be culled when selecting planting material. A good method is to remove all the slips from these plants when the fruit is half-grown, as not only has the grower then more time for such an operation than when picking the crop, but, in addition, fruit size and plant growth benefit by the early removal of these slips. Any plants that are missed can be culled out when harvesting the fruit and when removing the slips for planting. If it is proposed to use crowns for planting material, those from collar-of-slips or any other defective type should be marked with paint before the fruit is mature.

The number of slips varies so much with season of fruiting and plant vigour that it is difficult to set up any standard number of slips as a basis of selection to avoid collar-of-slips. This is a matter of experience and judgment. For example, where selected material fruiting in the first summer will average generally not more than two slips per plant, vigorous hold-over plants of the same selected stock may average over four slips per plant.

It must be noted, however, that plants of good type produce scarcely any slips when maturing fruit during the winter and spring months, while the collar-of-slips type averages about three slips per plant during the winter crop. It is therefore inadvisable to use slips from plants that mature slips during the autumn, winter, and spring months.

The "Long Tom" type of Abnormality.

The long Tom type (Plate 117) is distinguished by the length and narrowness of the fruit, which is also generally very knobby. The fruit usually matures late and, as suckering is delayed, the ratoon crop may not mature until the season following that in which ratoon fruit is produced by normal plants. Slips are numerous, but they are not clustered at the base of the fruit. Often the fruit, though still of a distinctive shape, may be of quite good size, but when produced under

Plate 117.

"Loose Tom" Abnormality.—Note the knobs at the base.

adverse conditions it is mostly of inferior type and even vigorous plants often bear poor fruit. The long Tom type is easily recognised and there should be little trouble in avoiding it. It is most prevalent in the Mary Valley, but somewhat similar sports have been found elsewhere.

Plate 118.
"Dry-fruit" (on left) and "Bottle-neck" Abnormalities.

"Dry-Fruit" and "Bottle-neck" Abnormalities.

The dry-fruit and bottle-neck types (Plate 118) are somewhat alike and instances have been recorded where both these fruit types have occurred on plants from the one parent. At the same time, there may be strains that run true to one or the other type. In the dry-fruit type the fruit is small, the flowers are usually absent and the fruitlets do not develop. In the bottle-neck type the lower fruitlets develop whilst

the upper ones remain undeveloped, giving the upper portion an appearance similar to that of the dry-fruit type. The plants are very vigorous and bear many slips and suckers, but as the fruits of both types are useless the plants should be eradicated.

General Considerations for the Elimination of Inferior Types.

The grower should note that, in eliminating undesirable types, the removal and discarding of slips from such plants before they are matured, or their rejection in any other way, will be fully effective only if he takes care not to use the crown, suckers, or butts from such plants.

It should be borne in mind that types such as collar-of-slips and Long Tom are much more prevalent in plants fruiting late in the season than among early fruiting plants, and also that they constitute a larger proportion of the hold-over plants in the plant crop field. This is probably because these types normally bear more numerous, and consequently smaller, slips. The term "hold-over" used above is applied to those plants which carry their first fruit later—often a season later—than the majority of individuals in a plant crop field.

Old ratoon areas that are not from selected material should be avoided, as abnormal plant types tend to be less apparent and selection is difficult.

The winter crop, too, is unsuitable for careful selection, as the collar-of-slips characteristic tends to be masked. As mentioned above, any slips occurring on this crop are suspect as belonging to the collar type.

Practical Methods of Pineapple Plant Selection.

Selection of planting material is best practised on plant crops and preferably on the summer fruit crop, both because this yields the most planting material and because the normal summer fruit and plant type most closely approaches that desired. Ratoon and winter crops are not so suitable, as in these the true nature of the plant is not always apparent, and certain defects may be less in evidence than in a plant crop. The main method of selection suggested for the grower at present is the culling of defective types, and this may be achieved by breaking off and discarding slips from such plants when the fruit is partly developed. If suckers from the same field are to be used for planting material, those on poor types of plants should be so marked as to avoid confusion. Similarly, if tops are to be used for planting, those on inferior plants should be marked with paint before the fruit is picked.

While it is advisable to avoid all planting material from the worst strains, there are in most plantations numerous plants that are doubtful or unthrifty, or in other ways fall short of the desired type, and which the grower at present can rarely afford to reject as a source of planting material. To overcome this, it is suggested that before the fruit is mature he should first remove the slips and, if these are to be used as plants, mark the crowns of all plants that are of definitely inferior strains. The rest of the plants can be divided into two classes—the selected and the second grade. The selected can be marked with white paint in order to distinguish them later on, and all the planting material within each class should be bulked, and the two lots planted separately. By doing this each season, and by taking all the planting material from

selected areas and keeping it separate, in the course of time selected material will be sufficient to supply the whole requirements of the plantation.

Although it is best to select before the fruit is removed, so that fruit type may be taken into consideration, it is possible even where this has been neglected to make a useful selection when removing the slips. Collar-of-slips plants can still be recognised by means of the large number of slips clustered high up on the fruit stalk, and can be discarded. Then well-grown slips from healthy plants with two or three vigorous suckers can be kept apart from the rest as selected stock.

To increase selected material rapidly, it is desirable to have it fruit for the summer crop, which carries more slips for planting material than the winter crop. The season has a marked influence on this, but it is the rule in southern Queensland that only the larger slips planted in the spring can be counted on to flower in the following spring and mature fruit in the subsequent summer. Small slips or winter tops planted in the spring will hold over and very likely bear for the following winter, when they will produce no slips.

It may therefore be worth while to store small slips and winter crowns till the summer, planting them before the summer harvest begins, and thus delaying them so that they will have a good chance of missing the winter crop mentioned above and fruit in the subsequent summer, two years after planting. In the same way, summer tops and sufficiently advanced slips from the summer crop might be planted, if the rush of harvesting should permit of doing this before the middle of April. These plants should mature summer fruit in about two years' time. Care should be taken with such plants to allow the bases to dry for a few days before planting, in order to avoid base rot.

The type of selection already described which consists in bulking all the planting material from selected plants is called mass selection, and this is the simplest and the quickest way of reducing the percentage of inferior plants in commercial plantings.

If the grower wishes to select further than this he can resort to careful clonal selection. A clone is the vegetative progeny of any one plant, and all plants in the one clone should be of the same strain. In clonal selection the grower keeps separate, through successive generations, all the plants from any one plant selected for its apparent superiority. If such a clone fails to maintain a fairly high standard, or if any inherently defective plants appear, the whole clone should be discarded. This offers a chance of improvement on the original stock, but it is slow, and requires care; for it must be remembered that all the inferior strains in use have occurred in the vegetative progeny of a few plants brought originally to this country.

Fruit and Plant Characteristics on which Selection is Based.

So far, the subject of plant selection has been considered largely from the angle of culling out undesirable types. At the same time, it is necessary to have an idea of what constitutes the desirable type which is the objective.

A good fruit (Plate 119) should be long and cylindrical, with square shoulders and base, flat eyes and small core. The crown should be small and single, and the fruit stalk short. The slips should not be

Plate 119.
Desirable Fruit of the Smooth Cayenne Pineapple.

too numerous at the expense of sucker growth, and they should not be clustered near the base of the fruit nor growing from it (Plate 120). The stem of the plant should be short, as high plants have a tendency to fall over when fruiting. The suckers should originate close to the ground, and should be about half-grown when the fruit is mature, so

Plate 120.
Fruit with Slips Desirably Placed on the Fruit Stalk.

that they will afford a measure of protection against sunburn (Plate 112) and also provide an early ratoon crop. The number of suckers is influenced by the growing conditions experienced, well-grown plants as a rule producing more suckers than plants grown under adverse conditions. In a field where growth is vigorous, and suckers are prolific and generally well developed, it is advisable to avoid plants with few or weak suckers, since they may belong to strains defective in this respect.

The above description is really of a well-grown plant maturing fruit in the summer. Since plant and fruit type are greatly modified by seasonal and cultural factors, it is not to be expected that all the progeny of a plant selected for its conformity to this ideal will measure up to this standard. They will, however, be far superior in type and uniformity to the general standard of plants in the majority of plantations.

PLANT PROTECTION

A New Insecticide—D.D.T.

J. HAROLD SMITH, Officer in Charge, Science Branch.

A NEW insecticide, which possesses unusual properties, has received a great deal of publicity during the last two or three years. It is technically known as dichloro-diphenyl-trichlorethane, a name which is now commonly shortened to D.D.T. Although its toxic properties are not unlike those of rotenone, one of the active principles in the familiar derris dusts, D.D.T. differs from most contact insecticides in two important ways: treated surfaces remain lethal to insects for long periods and the insecticide can be prepared with no great difficulty from relatively simple and readily available chemicals. The significance of these two characteristics was soon recognised. Any insecticide which adheres well to the plant without losing its toxicity on exposure to weathering would obviously simplify labour problems on the farm, for fewer treatments would be needed. Contact insecticides, such as derris, pyrethrum and nicotine, retain their toxic properties for only short periods after they are applied and treatments are required at relatively short intervals if a pest is to be controlled effectively in a crop. These insecticides are obtained from plants containing toxic ingredients which can be extracted and incorporated in sprays and dusts, e.g., nicotine, or the plants themselves may be ground and mixed with suitable carriers, e.g., derris. D.D.T., on the other hand, could be synthesised in the laboratory and this automatically opened up the prospect of manufacture on a commercial scale. Developments of this kind have been rapid, the pace having been dictated by pressing Service needs for an efficient insecticide to control mosquitoes, flies, and other insects and the shortage of other contact insecticides such as derris and pyrethrum, large quantities of which were formerly supplied by enemy or enemy-occupied countries.

FIELD EXPERIMENTAL WORK ON D.D.T.

The potential importance of D.D.T. in pest control practice on the farm was quickly realised and, at the earliest possible moment, supplies of D.D.T. were made available through Commonwealth authorities to the several States for experimental work on control measures for some of the more important pests of cultivated crops. Little was known about the concentrations at which the insecticide might be used in the field or the reaction of plant-feeding insects to it. Though a considerable amount of information of this kind has been obtained during the past eighteen months, it is still too early to define the place which D.D.T. will finally occupy in pest control practice. There can be no doubt, however, that the control of some pests on the farm will be simplified a great deal.

AVAILABILITY OF THE NEW INSECTICIDE.

At the present time, dusts and sprays containing D.D.T. are appearing on the Queensland market. Under existing legislation, all such products must be registered under "*The Pest Destroyers Act of* 1939" before they can be sold for agricultural purposes. Such registration is only granted when the members of the Pest Destroyers Board —appointed under the Act—are satisfied that the claims made by the manufacturers conform with the available information on the efficiency of the material. In the case of insecticides containing D.D.T., provisional registration may be granted until such time as the experimental data are sufficient to permit a definite opinion on the value of the product.

PREPARATION OF D.D.T. DUSTS AND SPRAYS.

Insecticides are usually marketed as dusts or sprays, both of which find a place in pest control practice on the farm and orchard. The preparation of D.D.T. dusts is a relatively simple matter, the insecticide being incorporated in a finely-ground clay such as kaolin, pyrophyllite, or talc. Diluents for D.D.T. dusts should be neutral; alkaline carriers such as hydrated lime may react with the D.D.T. and induce chemical changes which lessen the efficiency of the dust. Agricultural sprays containing D.D.T. are, on the other hand, more difficult to prepare, for the insecticide must first be dissolved in an oil or some other solvent which is then made compatible with water by means of suitable emulsifiers. Research on the associated chemical problems is in progress both in Australia and overseas, and there can be no doubt that efficient emulsions of this kind will sooner or later be marketed. It is reasonable to suppose also that any emulsions which may be sold in the near future will later be superseded by improved types.

PESTS AGAINST WHICH D.D.T. MAY BE EMPLOYED.

The farmer is, of course, particularly interested in the uses to which the available range of D.D.T. products can be applied on his own property and the consequent modifications in his present pest control programmes. It is possible from the work so far carried out in Queensland to indicate the reaction of some pests to D.D.T. and the concentrations at which the insecticide may be used for specific purposes. It must be emphasised, however, that all suggested treatments are tentative and subject to emendation in the light of subsequent experimental work and field experience. The following comments on specific pests or groups of pests should give a lead on appropriate treatments but it would still be unwise for the farmer to deviate from his existing practices without having first satisfied himself as to the desirability of the change. This can usually be done by small scale trials on the farm.

Bean Fly.

D.D.T. is more efficient than the white oil—nicotine sulphate spray used in present schedules for bean fly control. Treatment should commence within three days after germination and continue at four day intervals for periods which vary from 8 to 20 days, according to the time of the year and the intensity of the attack. Experimental work to date has indicated that a smaller number of treatments with D.D.T., at more widely spaced intervals, may give reasonable

control, but the above programme should be used for the time being. Dusts containing 1 per cent. D.D.T. and sprays containing 0.1 per cent. D.D.T. should both be effective, but the former is preferred owing to the lesser risk of injuring the plants.

Green Vegetable Bug.

Both D.D.T. dusts and sprays give good kills of the green vegetable bug and control may be expected if the insecticide is applied at any stage of an outbreak. The greater the D.D.T. content of the material used, the more rapidly will the pest be checked. High concentrations should be avoided until more is known about the possible injury which dusts and sprays may produce on a number of crops. Both a 1 per cent. dust and an 0.1 per cent. spray may prove adequate if they are applied at weekly intervals after the first appearance of the pest in the crop.

Beet Webworm.

The beet webworm is troublesome during late summer and the insecticides formerly available failed to cope with it. D.D.T. dusts and sprays have given very good control in severe outbreaks. A 1 per cent. D.D.T. dust and an 0·1 per cent. D.D.T. spray are suggested for this purpose.

Potato Tuber Moth.

There are indications that D.D.T. insecticides will be of value in controlling the potato tuber moth in the field. The sprays are more efficient than the dusts but routine applications of the latter will probably keep the pest in check. In irrigated crops grown during the spring months, treatment may be desirable at fortnightly intervals after the commencement of flowering in order to minimize tuber infestation before and during the harvesting period. Derris dusts should still be used for the protection of stored potatoes in both seed and table grades during the summer months.

Cabbage Moth.

Very good control of the cabbage moth has been obtained from both D.D.T. dusts and sprays. Reinfestation may not occur for three or four weeks after the insecticide is applied. Present indications are that 0.2 per cent. D.D.T. sprays are near the upper limits of plant tolerance if injury is to be avoided. Dusts containing 1 per cent. D.D.T. and sprays containing 0·1 per cent. D.D.T. may therefore meet normal requirements on the farm if they are applied at fortnightly intervals, or when larvae are seen on the plants. Treatment should cease at least three weeks before the commencement of harvesting.

Brown Vegetable Weevil.

Marked reductions in the larval population have followed the application of insecticides containing D.D.T. to lettuce and celery plants infested by the brown vegetable weevil. The concentrations of D.D.T. in the insecticide should be held at 1 per cent. for dusts and 0·1 per cent. for sprays, treatments being made when they are required, but not later than three weeks before harvesting begins.

Corn Ear Worm.

Only a limited amount of data has been obtained on the efficiency of D.D.T. against the corn ear worm. On crops such as sorghum, where the larvae must feed on treated parts of the plant surface, excellent

kills have been obtained. On other crops such as tomato or cotton, where the young larvae burrow into the flowers or fruits, the insecticide may be less efficient. The concentrations of the insecticide should remain at 1 per cent. for dusts and 0.1 per cent. for sprays until the reaction of the plants to higher dosages has been determined and the field data show a need for greater strengths.

Jassids.

The two most important jassid pests in Queensland are the tomato jassid, which also attacks potatoes, and the cotton jassid. Against insects of this kind, D.D.T. dusts have proved more efficient than nicotine dusts, which on account of the need for frequent applications are seldom a payable proposition. Applications of a 1 per cent. D.D.T. dust or an 0·1 per cent. D.D.T. spray whenever the pest position warrants it should meet requirements on the farm.

Aphids.

The results obtained with D.D.T. against the commoner aphid pests are very variable and seldom better than are already obtained with existing control measures. When crop treatment is necessary farmers should, therefore, continue to use nicotine dusts and sprays until more information is available. It is possible that aphids may find it difficult to establish themselves on plants which are treated with D.D.T. for the control of other pests.

Thrips.

As in the case of aphids, the results obtained with D.D.T. against thrips are inconsistent. This may be due to variations in the pest populations when the insecticide was applied. To halt an outbreak, D.D.T. seems relatively inefficient at least in the case of the onion thrips; to protect a crop from an outbreak, the insecticide may be of some value.

Mites.

It is improbable that D.D.T. will be of any value for the control of red spider and other mites which attack cultivated crops. Actually, the mite position may be aggravated owing to the lethal action which D.D.T. has on some of the parasites and predators which help to keep pests of this kind in check. Existing methods of controlling mites should therefore not be altered.

General.

The foregoing commentary on some phases of the D.D.T. investigations in Queensland gives some idea of the kinds of pests against which the insecticide may prove useful on the farm. For the first time, an insecticide is available which can be expected to control the green vegetable bug and perhaps other shield bugs effectively. Onerous pest control schedules on some crops may perhaps be simplified in so far as the one material, D.D.T., will cope with outbreaks of two or more insects for the control of which a number of insecticides were formerly combined in the spray or dust. Still another potential advantage of the new insecticide is the added scope it gives for dealing with field crop pests which could not formerly be controlled owing to the high cost of treatment; an obvious example is the cotton jassid which reacts

very quickly to D.D.T. A great deal has still to be learned about D.D.T., however, and the farmer should exercise careful judgment regarding insecticides containing it, remembering that D.D.T. is not a cure-all. As far as possible, the insecticide should only be applied when pests are already on the crop and then at moderate concentrations which can be expected to control them without injuring the plants. Close-spaced routine applications should be reserved for pests, such as the bean fly, on plants which require complete protection for relatively short periods, or the corn ear worm which must be destroyed before it enters the flower or fruit.

Vegetable growers, particularly of small crops, will almost certainly be the first to use the insecticide extensively. Citrus growers may find D.D.T. of little value in the solution of their immediate pest problems, except perhaps in the case of orchards where the larger horned citrus bug or the bronze orange bug cause damage every year. Deciduous fruit growers will likewise be unable to utilize D.D.T. in their pest control schedules at the present time though it is possible that the insecticide will be of value for codling moth control when suitable and safe sprays are available.

RISK OF PLANT INJURY.

One of the main difficulties in formulating recommendations for a new insecticide concerns the possible effect of its indiscriminate use on different plants at various stages of growth. There are no definite criteria which will indicate how a plant will react to treatment. Some plants such as cucumbers and beans are normally regarded as "touchy" in contrast to others such as citrus which may be classed as "hardy." Yet, in Queensland, citrus is one of the few plants which have been injured by D.D.T. sprays applied at routine experimental strengths. Injury on any plant may show up in various forms. Necrotic lesions may appear on the foliage. Even when such lesions are absent, stunting or abnormalities may occur during the growing period. How far these phenomena are attributable to the D.D.T. or, in the case of sprays, to the solvent in which it is carried to the plant is far from clear. At the present time, it seems that 1 per cent. dusts and 0·1 per cent. sprays can safely be used on most crops. Concentrations above these levels may get uncomfortably close to the danger point on some plants cultivated in Queensland.

RESIDUE PROBLEMS.

Vegetable growers, particularly those who use lead arsenate extensively, are familiar with residue problems and take all necessary precautions to ensure that the marketed commodity does not carry excessive amounts of the insecticides applied for the control of pests. Though it is probable that D.D.T. will prove to be less hazardous to both farmer and consumer than some other insecticides, it is poisonous and must be handled with all reasonable care. On crops such as cabbages and lettuce, in which the treated parts of the plants are used for food, treatment should cease at least three weeks before harvesting begins. On potatoes, turnips, and carrots, as well as the several field crops, the residue problem is of no moment and does not influence the grower's pest control programme.

Insect Pests of Grain Sorghum.

W. J. S. SLOAN, Agronomist.**

THE area planted to grain sorghum has expanded steadily in Queensland during recent years for the crop is drought resistant and particularly suited to many parts of the State where rainfall is low and stress periods occur during the growing period.

The principal insect pests found on the crop in the field are sorghum midge, corn ear worm, yellow peach moth, Homoesoma caterpillar, locusts, grasshoppers and aphids, while the Angoumois grain moth and

Fig. 1. Fig. 2. Fig. 3.

Plate 121.

GRAIN SORGHUM HEADS INFESTED BY MIDGE: Fig. 1.—Severely infested head with few grains; Fig. 2.—Moderately infested head with about one-third of grains developed; Fig. 3.—Normal head.

the rice weevil are primarily pests of the stored grain. Insects of minor importance often seen in grain sorghum heads include a small, pink, scavenging larva*, and the dried fruit beetle†, both of which feed on injured grain in the head, the green vegetable bug‡ and the Rutherglen bug¶, which suck the plant juices from immature heads, and a small dark-coloured bug‖ which preys on other insects. The more important insect pests are here discussed in some detail.

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* *Pyroderces dendrophaga* Mayr.
† *Carpophilus hemipterus* Linn.
‡ *Nezara viridula* Linn.
¶ *Nysius vinitor* Berg.
‖ *Triphleps australis* China.

** Formerly an officer of the Science Branch.

SORGHUM MIDGE.

Sorghum midge* is a serious pest of grain sorghum in the flowering stage. Other plants attacked include broom millet, Sudan grass, saccharine sorghum and Johnson grass. No portion of the plant other than the flowering head is attacked. Injury is confined to the developing grain and damaged heads are wholly or partially sterile (Plate 121). In a heavily infested head numerous small, empty pupal cases, from which adult midges have emerged, can be seen hanging loosely from the empty glumes (Plate 122). Strong winds appear to check egglaying and, if they occur during the flowering period, losses may be slight even though the midge population is high. As a rule, tiller heads are more heavily infested than the main head, and injury is usually severe in late maturing varieties and in late planted crops.

Plate 122. [*Drawing by William Manley.*

Tip of Glume with Empty Pupal Case Attached × 12.

Life History.

The adult sorghum midge (Plate 123; Fig. 4) is a very small, fragile insect about one-twelfth of an inch long, and characterised by an orange-coloured abdomen. On calm sunny mornings during the summer months, the midges are frequently seen swarming around the flowering heads of a crop, some in flight, other crawling over the flowers and many placing their eggs inside the glumes. The female midge may lay about 100 eggs during her short life of only a few days. The very small, white, elongate eggs (Plate 123; Fig. 1) are laid singly, but several may be inserted into each flower. After about two days in summer, a small white, legless larva emerges from the egg and commences to feed on and eventually destroys the young seed. In eight to ten days, the larva (Plate 123; Fig. 2) is full-grown and pupates, sometimes inside a delicate cocoon. The pupal stage lasts about three days in summer during which period the pupa (Plate 123; Fig. 3) moves from the base of the flower to the tips of the glumes. The adult fly then emerges to recommence the life cycle which is completed in twelve to fifteen days in summer. The pest overwinters in the larval stage among trash in fields where grain sorghum and other host plants have been grown.

* *Contarinia sorghicola* Coq.

Control.

Economic control of the sorghum midge cannot yet be obtained with insecticides and losses can be reduced only by cropping practices designed to minimize infestation from outside sources. The residues of Sudan gras, saccharine and grain sorghum crops in which the pest may overwinter should be raked up and burned at the end of the season and the land ploughed as soon as possible. If Johnson grass cannot be completely eradicated, flowering should be prevented by regular cutting.

Plate 123. [*Drawings by William Manley.*

Sorghum Midge: Fig. 1.—Egg × 100; Fig. 2.—Larva × 10; Fig. 3.—Pupa × 12; Fig. 4.—Adult Female × 18.

Early planted crops produce heads before the midge populations become high in late summer and autumn, and suffer little damage. Such crops mature before the end of the wet season and conditions may not be suitable for harvesting. In Queensland, therefore, plantings must be timed so that the crop will mature towards the end of March and can be harvested after the heavy summer rains, i.e., from April onwards. The rate at which varieties mature is therefore important. Of the better known varieties, Wheatland Milo is somewhat slower to mature than Kalo or Hegari, and should be planted earlier. Varieties such as Hegari and Kalo, which carry the greater part of the crop on the central head or mature their tillers about the same time as the central head, generally suffer less from midge damage than varieties with a long flowering

period. Good seed, true to type, must be used for all plantings; otherwise irregular flowering may favour an early build-up of the midge population to the detriment of the main crop. Gaps in the stand should never be filled in because the later developing heads may be completely sterile as a result of midge infestation; it is better to disc a poor strike and replant the whole area.

If the necessary precautions are taken, Sudan grass, saccharine sorghum and related fodders may be grown in more or less close proximity to grain sorghum without midge losses in this crop being excessive. Any Sudan grass crops which flower some weeks before the grain sorghum should be cut for hay not later than one week after flowering begins. In making the decision to mow, the risk of feeding grass hay made from non-flowering Sudan grass should be recognized, since such hay may be as dangerous to stock as the green grass itself would be if grazed at the same stage of growth. Bulk may be lost by thus haying the crop but the operation is necessary to insure against the early development of large midge populations. Saccharine sorghum usually matures later than grain sorghum and if planted after the latter crop, is unlikely to accentuate midge infestation in the grain crop.

CORN EAR WORM.

Corn ear worm* may attack grain sorghum plants at all stages of growth, but it is primarily a pest of the flower heads and developing grain. It also feeds on numerous weeds and cultivated crops such as maize, cotton, tobacco and tomato. When eggs are laid on young plants, the larvae feed mainly on the unfurled or partly furled leaves in the growing tip and the injury produces a shot-hole effect in the fully developed leaf. The eggs are, however, more commonly laid on sorghum heads as soon as they appear in the throat of the plant. The young larvae emerging from these eggs eat into and destroy the flowers; later they wander over and through the head, feeding on the soft grain. Few, if any, larvae remain in the head when the grain is mature.

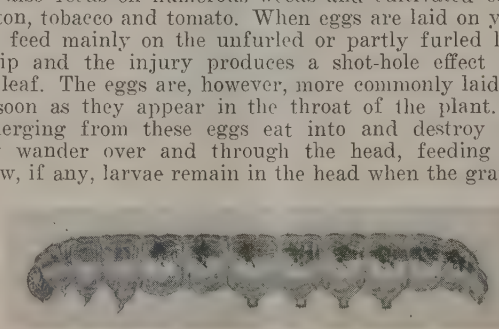


Plate 124. [*Drawing by William Manley.*
Corn Ear Worm × 2.

Life History.

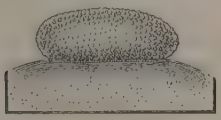
The parent moth is a stoutly built insect with a wingspread of about one and a-half inches. The forewings are greyish brown, often tinted with red; the hindwings are creamy yellow, with the veins and a broad marginal band smoky. The moths lay their eggs at dusk when flight takes place, but remain concealed during the day, unless they are disturbed. The dome-shaped egg is cream-coloured when newly laid, and is about half the size of a pin head. After an incubation period of three to six days, a small whitish larva emerges from the egg. When full-grown (Plate 124), the larva is about one and a-half inches long and

* *Heliothis armigera* Hbn.

variable in colour with shades of green, brown, yellow and red interspersed with black markings. One shade usually predominates. The larval stage lasts 12 to 21 days in warm weather. Pupation takes place in an earthen cell in the soil where the larva changes into a dark-brown smooth pupa which is about three-quarters of an inch long. The adult moth emerges from the pupa in 10 to 14 days during summer.

Control.

Insecticidal control of this pest on grain sorghum is not practicable. Weed growth on which the insect breeds should be suppressed. Generally, crops maturing in late April and May are not heavily infested.



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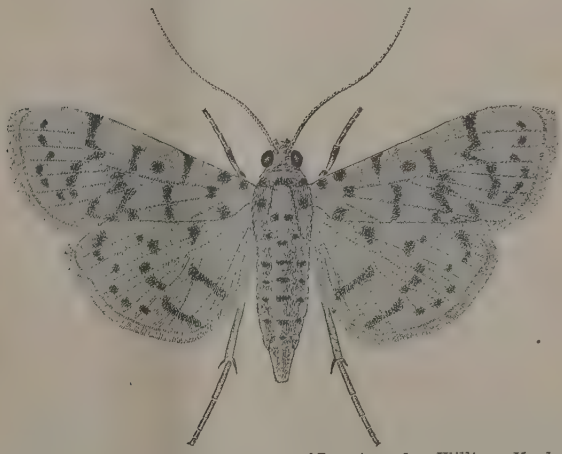

4 [*Drawings by William Manley.*

Plate 125.

YELLOW PEACH MOTH: Fig. 1.—Egg × 30; Fig. 2.—Larvae × 3; Fig. 3.—Pupa × 5; Fig. 4.—Moth × 3.

YELLOW PEACH MOTH.

Yellow peach moth* is widely known as a pest of maize, cotton, papaw and grain sorghum. Although a pest of grain sorghum in all parts of the State, it is most injurious to crops grown in the wetter areas near the coast. Grain sorghum becomes infested as the grain begins to mature and the attack may develop rapidly. The larvae feed on the grain and the head becomes cluttered with webbing and excreta. In severe attacks, heads touching each other are bound together in a tight mass with the webbing spun by the larvae. The pest also bores into and

* *Dichocrocis punctiferalis* Gn.

tunnels through the pith of the stalks though this type of damage is less common in grain sorghum than in maize. In coastal areas, yellow peach moth may cause the almost complete failure of an otherwise healthy crop.

Life History.

The adult moth (Plate 125; Fig. 4) is a conspicuous insect having orange coloured wings with numerous black spots and a wing span of approximately one inch. Small, oval eggs (Plate 125; Fig. 1) are laid on the head when the grain is still in the milky stage. The larvae which emerge from them fed on the grain and at the same time spin tunnels within which they move. The webbing becomes fouled with excreta which gives a characteristic dirty appearance to the interior of an infested head. In approximately three weeks in summer, the larva (Plate 125; Fig. 2) is full-grown and is then slightly less than one inch long. It is greyish-green, sometimes tinged with pink, and dark oval spots occur on the body. Pupation takes place in the sorghum head, the pupa (Plate 125; Fig. 3) being brown in colour and about three-eighths of an inch long. In warm weather, the pupal stage is completed in two to three weeks; in winter it may be prolonged to eight weeks or more. In cold weather, larval feeding is slight and the insects are relatively inactive.

Control.

Burning the residues of infested crops when harvesting is completed, and ploughing the field in the winter, will destroy many larvae and pupae. Grain sorghum should not be planted near maize crops which will mature before it and thus be sources of infestation. The grain should be harvested as soon as it is dry and, if header harvesters are not used, the heads must be threshed immediately; otherwise the larvae will continue to feed on the stacked heads.

Damage is most serious in varieties with compact heads such as White Dhurra and Texas Blackhull Kafir. More open headed varieties are less susceptible. A very open headed variety known as Egyptian corn is almost immune from attack; it is, however, tall and slender stemmed, and not suitable for grain production in areas where headers are in use.

In recent spacing trials with the variety Kalo, which is normally susceptible to injury, yellow peach moth infestation has been decreased by close planting which reduces the size of individual heads without affecting the gross yield per acre. Heavy sowings in rows three feet six inches apart may therefore be an advantage in coastal areas where attacks are apt to be severe.

HOMOESOMA CATERPILLAR.

The Homoesoma caterpillar* appears on the developing grain sorghum heads earlier than the larvae of the yellow peach moth and attacks continue as long as the crop remains in the field. The appearance of an infested head is similar to that caused by the yellow peach moth, but there is usually less webbing present. Homoesoma, however, does not bore into the stalks. Normally, the two pests occur together in the same head. In such mixed infestations, the Homoesoma caterpillar is more numerous but the individual larvae are smaller and cause less injury.

* *Homoesoma* sp.

Life History.

The adult moth (Plate 126; Fig. 4) has a wing spread of slightly more than half an inch. The forewings are dark-grey with lighter transverse markings, the hindwings being light-grey and fringed with fine hairs. The moth commences to lay eggs (Plate 126; Fig. 1) on the head shortly after it has emerged from the enveloping leaves; egglaying in this species therefore follows that of corn ear worm and precedes that of the yellow peach moth. From these eggs emerge larvae which feed on the developing grain. When full-grown, the larva (Plate 126; Fig. 2) is slightly less than one-half inch long and brownish-green in colour with a darker stripe along each side. Pupation takes place within the sorghum head in light, silken cocoons, each of which contains a brown pupa (Plate 126; Fig. 3) about one-quarter of an inch long. From this pupa, the adult emerges later to begin the life cycle again.

Plate 126. [*Drawings by William Manley.*

Homoesoma Caterpillar: Fig. 1.—Egg × 50; Fig. 2.—Larva × 5; Fig. 3.—Pupa × 7; Fig. 4.—Adult × 5.

Control.

The cultural measures already outlined for the control of the yellow peach moth are equally applicable to the Homoesoma caterpillar.

LOCUSTS AND GRASSHOPPERS.

Several species of locusts and grasshoppers may attack grain sorghum at any stage of growth and if large numbers of the pest appear, crops may be partly or completely destroyed by hopper or flier swarms. One important species is the Australian plague locust* (Plate 127), which varies in length from one to one and a half inches and can be distinguished from

* *Chortoicetes terminifera* Walk.

similar pests by the black tip to the otherwise clear hindwing. The spur-throated locust* is a much larger insect which varies from two or three inches in length and has clear hindwings. The common name is derived from the downwardly projecting spur under the throat. The yellow-winged locust† varies from one and a-half to two inches in length and the hindwings are bright yellow at the base with a centrally placed curved black band and transparent tips. A "clacking" noise is produced during flight. A fourth species‡ commonly encountered in monsoon scrub areas is a large, robust grasshopper measuring three and a-quarter to three and three-quarter inches in length and dark greyish-brown in colour.

Plate 127. [*Drawing by William Manley.*
AUSTRALIAN PLAGUE LOCUST.

Life History.

The life cycles of locusts and some grasshoppers are similar. Eggs are laid in the ground, each hole being filled with twenty to fifty eggs and plugged with frothy material which hardens into a dark-brown capsule. Tens of thousands of these capsules may occur in limited areas known as eggbeds and located on ground which is either bare or sparsely covered with vegetation. After an incubation period which varies according to the species and seasonal conditions from two weeks to several months, very small hoppers similar in appearance to the adults but without wings, emerge from the ground and soon begin to feed on the nearby herbage. These hoppers grow quickly and moult several times during their development. The hoppers usually aggregate in dense bands and may travel a considerable distance injuring any crops and pastures in their path. Hopper growth is completed in seven or eight weeks and flier forms appear. The fliers of locusts can migrate over considerable distances.

* *Austacris guttulosa* Walk.
† *Gastrimargus musicus* Fabr.
‡ *Valanga irregularis* Walk.

Control.

Control of the hopper bands can only be obtained by treating them with a poison bran bait. Any eggbeds, seen when they are established, should be examined regularly for hopper emergence. Treatment begins as soon as the young hoppers are in dense bands on or near the eggbeds. The method is less efficient against older hoppers, particularly if these are moving rapidly. The bait formula is ½ lb. arsenic pentoxide, 1 to 1½ quarts molasses, 24 lb. bran and 2½ gallons water. The arsenic pentoxide and molasses are dissolved in separate 1 pint lots of boiling water. To each, ¾ of a gallon of cold water is added. The two solutions are then stirred together and made up to 2½ gallons. This poison solution is gradually poured into the prescribed amount of bran which is thoroughly mixed to form a moist but loose crumbly mash. The whole area occupied by the swarm, together with a marginal strip thirty feet wide around it, is then baited by broadcasting the poisoned bran thinly and evenly as in the hand sowing of grain. The quantity of bait prepared from 36 lb. dry bran is sufficient to cover one acre of ground. Bait should be broadcast when the hoppers are active.

As with all poisons, arsenic pentoxide should be handled and stored carefully. The hands of operators must be kept well covered with grease and scrubbed after handling the bait in any way. Birds and animals should be excluded from mixing sites and bulk supplies of baiting materials. No absolute guarantee of safety can be given, but the danger to animals foraging over properly baited ground is practically negligible because of the small amount of poison likely to be taken up from a thinly and evenly distributed bait.

GRAIN APHID.

The grain aphid* is a common pest of grain sorghum and occurs on other cereals and grasses, the insects being concentrated around the growing tip of the plant. A reddish discolouration appears on infested leaves and the terminal leaf may collapse, particularly when the soil moisture is low. Under such conditions, sorghum heads often fail to emerge cleanly from the throat of the plant. Infestation of the heads is common even in crops growing under good conditions. However, natural enemies are active late in the season and the heads are usually free from the pest when the crop is harvested, although the grain may be discoloured by sooty moulds which develop on the sugary excretions of the aphids.

Life History.

Grain aphids are soft-bodied, greenish-brown insects with a dull-white mealy covering. They are about one-tenth of an inch long and move slowly around the plant sucking the plant juices through their piercing mouth-parts. They are usually densely clustered in colonies and have a characteristic habit of excreting a sweet sticky substance called honeydew which attracts the attention of other insects, particularly ants.

Control.

A number of parasites and predators such as hover fly larvae and ladybird beetles attack the aphids. Control by means of insecticides is not justified on the farm in normal circumstances.

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* *Aphis maidis* Linn.

ANGOUMOIS GRAIN MOTH.

Many cereals are attacked by the larvae of the Angoumois grain moth.* In grain sorghum, injury is first encountered in the field but continues in storage sheds after the crop is harvested. Even if the grain is free from the pest when harvested, attacks may still occur in the barn.

Life History.

The adult moth (Plate 128), which is often seen in barns where infested grain is stored, has a wing-spread of about half an inch. The slender forewings are pointed at the tips and yellowish-brown to buff in colour; the hindwings are grey, with a fringe of long hairs on the hind margin. In the field, the eggs are laid singly or in batches on the

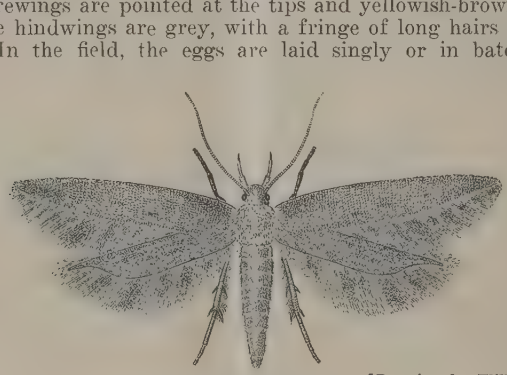


Plate 128. [*Drawing by William Manley.*

ANGOUMOIS GRAIN MOTH × 5.

heads as the grain matures. Each of the oval eggs is about one-fortieth of an inch in length and white when first laid, darkening to reddish-brown before hatching. A few days later, the minute whitish larva, emerging from the egg, bores directly into and feeds within the grain. When full-grown the larva tunnels towards the outside of the seed and pupates, often near the tip of the sorghum grain. Later, after emerging from the pupa, the adult moth forces its way through the seed coat and escapes. Sorghum grain from which moths have emerged all show the small, neat, emergence holes. In summer, the larval stage lasts about three weeks and the pupal stage a few days; thus the life cycle may be completed in four weeks.

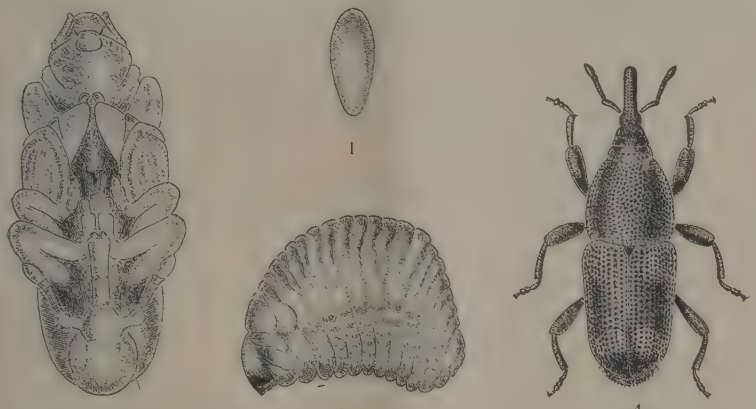
Control.

Grain sorghum should be harvested as soon as the grain matures and stored in clean premises. Good ventilation is desirable. The drier the grain the less will it suffer from attacks by the Angoumois grain moth. Cutting and storing the heads in a barn, a practice among some poultry farmers, should be avoided if possible.

Fumigation is sometimes needed to control the pest and presents no difficulty if the grain is held in silos or well constructed barns. Bags stacked in the open under a temporary roof can be fumigated by enclosing the stack in one or more overlapping tarpaulins, the lower edges of which are sealed by an earth ring. Carbon bisulphide is the fumigant commonly employed, although it is highly inflammable and explosive;

* *Sitotroga cerealella* Ol.

naked lights must not be permitted near the grain during treatment. In a reasonably gas-tight barn or silo, carbon bisulphide should be used at the rate of 5 lb. (3 pints) to each 1,000 cubic feet of air space. Under a tarpaulin or in a barn which cannot be properly sealed, at least double this dosage may be required for satisfactory results. The measured quantity of carbon bisulphide is poured into a layer of empty sacks placed on top of the grain and then the opening is carefully sealed. The fumigant vaporises and the fumes, being heavier than air, percolate downwards through the grain. After thirty-six hours exposure to carbon bisulphide the grain should be thoroughly aired.



[*Drawings by William Manley.*

Plate 129.

Rice Weevil: Fig. 1.—Egg × 30; Fig. 2.—Larva × 12; Fig. 3.—Pupa × 15; Fig. 4.—Adult Weevil × 12.

RICE WEEVIL.

Although the rice weevil* occurs on grain sorghum in the field, it is chiefly of importance as a storage pest. Most cereals are attacked and losses in maize and wheat as well as sorghum grain are common. The rice weevil shows a marked preference for tropical and sub-tropical regions, while a closely allied species known as the granary weevil† attains its maximum abundance in temperate zones. Although rice weevil attacks sound grain, grain which has been damaged by other insects in the field is particularly susceptible to further injury. The quality of infested grain stored for any length of time may be very considerably impaired.

Life History.

The dark-brown rice weevil (Plate 129; Fig. 4) possesses the typical weevil snout and is about one-sixth of an inch in length. It has four reddish-brown spots on the wing covers. The adult may live four or five months and lays up to four hundred eggs (Plate 129; Fig. 1). These are placed singly in cavities excavated in the grain and from each a white, legless larva hatches in a few days. The larva (Plate 129; Fig. 2) feeds within the grain for two or three weeks and is then about an

* *Sitophilus oryzae* L.
† *Sitophilus granaria* L.

eighth of an inch in length and full-grown. It pupates (Plate 129; Fig. 3) within the grain and a week later the adult weevil emerges. The life cycle occupies about one month in summer but may be much longer in winter. Probably six or seven generations are completed each year in coastal Queensland. The larvae cause most of the damage to cereals but adult weevils also feed to some extent on the grain.

Control.

Control of the rice weevil may be achieved by the methods recommended for the Angoumois grain moth. Ground magnesite mixed with the grain at the rate of four ounces per bushel will slow down and sometimes prevent the development of the insect. Thorough coverage of the grain is, however, essential and treatment may be carried out on a mixing board, or, better still, both grain and dust can be fed through a seed dressing machine. At the concentration used, treated grain may safely be fed to stock.

ANSWERS.

(*Selected from the outgoing mail of the Government Botanist.*)

Scrub or Mountain Pandanus.

J.T. (Atherton)—

The specimen is the Scrub or Mountain Pandanus (*Pandanus monticola*). The genus *Pandanus* is a fairly large one and consists of the ordinary screw pines which are found along beaches or in low-lying forest country in North Queensland. Some with rather smaller fruits than these grow along creeks and rivers, and several of the present type occur mostly in rain forests or jungles. The species *monticola* is the only one of this type found in Queensland, but several others occur in New Guinea. Some of the mountain species in New Guinea are rather fleshy and an important article of diet to the natives. The Queensland one is of a drier and more inedible nature.

Poa Aquatica. Panicum Muticum.

J.Q. (Eidsvold)—

Poa aquatica is not a success in Queensland. It has been reported as growing in one or two places and doing well, but in all cases other grasses have been mistaken for the *Poa* and the *Poa* has died out. The climate at Eidsvold is too hot for the successful cultivation of this grass. It may grow during the winter, but the approach of warm weather would almost certainly be too much for it.

Panicum muticum grows remarkably well during the winter months, but is very frost tender. It will recover, however, on the approach of warmer weather.

"Strychnine Bush."

A.F.E. (Mount Emlyn)—

The specimen is *Myoporum acuminatum*, a shrub or tree very widely spread in Queensland. It is sometimes called Strychnine Bush, and feeding tests have shown that it is poisonous to stock. At times, however, stock have been known to eat it quite freely without any ill effects following. The plant is a handsome one with its glossy foliage and small white flowers, and well worthy of garden culture. It should make a good hedge, as it seems to stand trimming quite well.

Surgical Shock and Acute Blood Poisoning Following Lamb Marking.

G. R. MOULE, Veterinary Officer, Sheep and Wool Branch.

THERE are several diseases and other pathological troubles associated with lamb marking and the occurrence of some of these may cause heavy mortalities among marked lambs. In this article the main symptoms of surgical shock and acute blood poisoning are described and the preventive measures to be adopted are discussed. A later article will deal with tetanus, fly-strike and arthritis following lamb marking.

SURGICAL SHOCK.

Quite sudden mortalities of wether lambs have resulted from surgical shock and these have been investigated in the central west.

Characteristically, deaths from this cause occur within an hour after the lamb is released from the marking cradle. Usually the fattest and best developed wether lambs are affected and the losses can reach serious proportions.

Symptoms.

1. Affected animals usually do not travel far from the marking yards after release, and their movements are inclined to be listless and give the impression of weakness; finally the lambs "go down" and lie quietly.

2. On examination the lamb gives the impression of having fainted, the mucous membranes of the eyelids, nose and mouth are blanched, the limbs feel cooler than normal, and often the reflexes are lost.

3. The temperature is not raised, and the respirations may be accelerated initially, but later they become gasping and irregular.

Death is usually rapid and quiet.

Post-mortem Findings.

There is very little to see on post-mortem examination of lambs that have died from shock. The main features are:—

(1) Obvious evidence of free bleeding from the stumps of the torn blood vessels which had supplied the testicles prior to the castration operation.

(2) Some congestion of the small blood vessels of the abdominal organs.

Cause and Prevention.

Shock results from the liberation into the blood stream of a substance which causes rapid dilatation of the smallest blood vessels—the capillaries—supplying the organs of the body, and as these become engorged with blood the animal virtually bleeds to death into its own organs. A suitable line of treatment, then, is based on injecting the drug which will cause these capillaries to contract to their normal size, but it is doubtful if it is practicable to do this under field conditions, and it is better to aim at prevention.

Among the main factors predisposing the animals to surgical shock are starvation, extensive damage to the body tissues during surgical processes, and bleeding.

Preventive measures should aim, therefore, at reducing these factors to a minimum by arranging the work so that the lambs are in the yards for a minimum of time, and so that they are separated from their mothers for as short a time as possible prior to marking.

Although it is not seen, there is extensive internal damage done by the usual practice of drawing lambs' testicles, and if mortalities from shock occur it is preferable to split the purse and use an ordinary emasculator to remove the testicles from the larger lambs.

ACUTE BLOOD POISONING.

Very heavy mortalities have resulted in Queensland sheep areas from acute blood poisoning following on the marking operation. In outbreaks investigated the trouble has been confined mainly to wether lambs and on some properties over 50 per cent. of all male animals marked in any one year have been lost. Deaths commence 48 to 72 hours after marking and usually continue till about the seventh day after the operation was performed.

Several names have been given to this condition, depending upon the type of germ which infects and becomes established in the wounds, but the most common conditions seen are malignant oedema and gas gangrene.

Cause.

Both malignant oedema and gas gangrene are caused by infection of the marking wounds with a particular type of germ, which can be cultivated under laboratory conditions only in an atmosphere free from oxygen, or under anaerobic conditions as they are called; hence they are known as anaerobes.

The anaerobes are widely distributed in soil and they thrive very well in the damp manure of sheep yards. These germs do not multiply when oxygen is present, but they have the capacity to form a protective coat about themselves (known as "spore" formation) when conditions are not suitable for their multiplication, i.e., when oxygen from the air penetrates to where they are living or when the soil becomes too dry. These spores are highly resistant; they can withstand drought conditions and hot sunlight; many of them are not killed by disinfectants, and some can even withstand the effects of boiling for short periods of time.

The dust blowing about in the sheep yards is thus often infected with anaerobic spores and during the normal marking procedure it is quite impossible to protect the marking wounds from infection if the work is carried out in a permanent sheep yard.

After castration a clot of blood usually forms inside the purse, and the tip of the purse becomes sealed over with a clot which sticks the edges of the wounds together. Should an anaerobic infection take place at the time of the castration of the lambs, ideal conditions—food, warmth, moisture, protection from oxygen of the air—are provided for the organism and rapid multiplication of the germs results.

Symptoms.

1. The sick lambs segregate themselves from the flock and usually lie about in the paddock, or stand with the back arched and the head down.

2. The affected animals are disinclined to eat, and those *in extremis* lie quietly when approached and are easily caught. Some animals on being forced to move show a lameness of one or both hind limbs or even a marked disinclination to move, but on being approached exhibit a surprising degree of activity.

3. On being caught and examined, the animals are seen to have a hot, soft, discoloured swelling over the region of the groin and scrotum. Sometimes this swelling extends around over the muscles of the buttock and/or along the belly, towards the pizzle, which becomes swollen and reddened. The swelling itself may be soft and putty-like, or it may "crackle" on being touched gently with the fingers. The skin over the swollen area may be blackish-red in colour and it often exudes a blood-stained fluid. When this happens the wool over the affected area assumes a rose-pink colour, and plucks easily from the skin. The bare skin over the groin peels easily on being touched.

Death usually occurs within about 24 to 30 hours of the first symptoms being noticed.

Post-mortem Appearance.

Post-mortem examination shows typical dark discolouration of the muscles under the affected areas; but, as the germs which cause this trouble are very virulent, graziers are advised not to post-mortem affected lambs. Obviously, the symptoms cannot be mistaken.

Prevention.

From the foregoing it will be realised that preventive measures should aim at getting the lambs right away from the source of infection, i.e., carrying out the marking in temporary yards, as against the usual permanent yards.

The marking knives should be sterilized carefully by boiling for half an hour before each day's work, and they should be dipped in a reliable disinfectant solution at frequent intervals during the day.

If these measures fail and further trouble develops, technical assistance should be sought. Recent investigations indicate that it may be possible to control these losses by the use of a specific anti-toxin. The first essential before this anti-toxin can be used is a correct diagnosis of the cause of the mortalities and accordingly graziers are not advised to attempt to use the anti-toxin without previously obtaining veterinary advice. The cost of the anti-toxin would be about 4½d. per lamb, and it could be applied at the time of marking, without very much additional labour.

Culling the Flock.

J. L. HODGE, Senior Adviser (Sheep and Wool).

WHAT is the reaction of the ordinary sheep farmer to the competition of synthetics in his business? He probably regards the position as somewhat dangerous to the prosperity of his industry and mainly leaves it at that. The grazier should realize that one remedy, and an important remedy at that, is in his hands and his hands alone. That remedy is the improvement of his product. Only the best of wool will compete successfully on a price basis with some of the better synthetics.

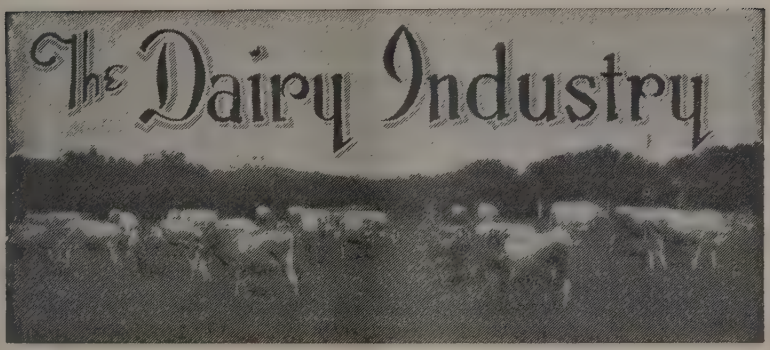
How to improve the quality of the staple produced quickly is the question. This can only be brought about by the systematic culling of the flocks annually, and the introduction of better rams. Every breeder's flock should have the attention of a competent man. The type of sheep for a particular district is of importance. For instance, it would not be correct to try and produce the finest of merino wools on far outback Western areas. Neither would it be the correct policy to grow stronger merinos in a district proved profitable for the finer wools. Therefore, type for country should have the most careful consideration.

The actual culling should be done when the sheep are as nearly full-woolled as they can be. Apart from obvious culls—such as undersized sheep, malformed sheep, undershot or overshot jaws, poor constitution, and so on—the type of covering desired should be constantly in the mind of the classer. It should be the object of the man in charge to retain a line of breeders as even as possible, having strict regard for the type agreed on as suitable for the particular tract of country. Having selected the flock to be retained as breeders, it is of the utmost importance that they be adequately fed. The question of over-stocking naturally comes in here. Graziers are strongly advised to carry well within the proved carrying capacity of the holding. Three sheep properly fed will yield more than four half-starved animals. In addition, the nourished sheep will produce and rear better lambs.

The matter of the disposal of the culls is regarded as one of the utmost importance. Too often it is the practice to sell these cull ewes, with the result that their breeding continues, thus defeating the main object of the culling. Judged by and large, this breeding from cull ewes gets nowhere. The grazier is urged, in the interests of the industry, to fatten the culls. They bring their full value when fat, and the industry is better off without them as breeders.

To achieve the desired rapid improvement in the flocks, culling the ewes is only half the job. The joining of suitable rams is just as important. If a grazier has been using a certain blood with satisfactory results, he is urged to stick to the stud supplying that blood, and at the same time to purchase a higher grade of ram. The few extra guineas spent in rams should not be regarded just as an additional expense. Provided the right selection is made, the expenditure should be looked upon as an economy, having regard to the future improvement in the flock.

Rams should be slightly stronger in the fibre of the fleece than the ewes with which they are to be joined. Violent contrasts in the covering of the sexes to be mated should be avoided.



Milk Cooling on Darling Downs Farms.

G. R. SIGLEY and W. J. PARK, Dairy Advisers, Division of Dairying.

THERE is abundant evidence to show that the cooling of milk considerably improves its keeping quality by retarding bacterial multiplication; hence efficient cooling of milk is a prime factor in connection with the production of milk either for the liquid milk market or for cheese manufacture.

The ideal temperature at which to store milk on the farm is 50-55 deg. F. or lower, but this temperature is difficult to reach without the aid of mechanical refrigeration. Much can be done with various systems of water cooling, provided the water temperature is low enough, but no other system of aeration can be considered suitable for the purpose.

Sub-surface water in colder countries ranges from 37 deg. F. to 57 deg. F. in the summer months, but it is difficult in summer to obtain bore or well water in Queensland at temperatures below 68 deg. F. and this leaves no alternative but to provide a method of cooling the water and maintaining it in as cool a condition as possible. This aspect will be dealt with under the heading of "Systems of water circulation."

After being drawn from the cow, milk has a temperature ranging from 94 deg. F. to 100 deg. F., depending on whether it is produced in winter or summer months and whether by machine or hand milking. At this temperature the development of undesirable types of bacteria is rapid. If cooling is not practised, the rate of fall in temperature is slow and considerable time elapses before the milk reaches within 2 deg. F. to 4 deg. F. of atmospheric temperature.

A study of methylene blue test results on samples of milk examined at cheese factories and milk plants over the past seven years reveals that milk quality shows a marked improvement in winter. This rise in quality can only be attributed to colder weather conditions resulting in

retarded bacterial development, and not to any improved methods of dairy hygiene. On the contrary, more care is taken in cleansing and sterilizing of dairy utensils in summer.

The following table, which shows the average temperature and quality of mixed milk delivered to factories on the Darling Downs in summer and in winter, clearly illustrates the necessity for cooling milk.

Uncooled Milk in Can.		Cooled Milk in Can.	
Temp. °F.	Methylene Blue Time (Hours.)	Temp. °F.	Methylene Blue Time (Hours.)
93	3	73	5
97	1½	76	3½
98	2½	71	5
96	2¼	80	3½
95	1½	72	3¾
94	1¼	68	4
97	2	70	4½

Quality tests at factories also demonstrate that cooling of milk is essential to high gradings. The following results of methylene blue tests on cooled and uncooled milks show how decreased bacterial activity in the cooled milk lowers the methylene blue reduction time.

Quality of Mixed Milk.	Summer Av. Temperature 78° F.	Winter Av. Temperature 64° F.
	Per cent.	Per cent.
First grade	58·0	85·0
Second grade	42·0	15·0

METHODS OF COOLING USED IN QUEENSLAND.

The methods of cooling milk practised in Queensland for many years may be considered to fall into three main groupings:—(*a*) atmospheric cooling; (*b*) water cooling; and (*c*) refrigeration.

In turn these three main groupings are made up of several sub-groupings. The purpose of this article is to describe and discuss the systems of milk cooling and to comment on their advantages and disadvantages.

Atmospheric Cooling or Aeration.

For the means by which atmospheric cooling, or aeration, is accomplished, the term aerator is a better term than cooler. This system of cooling was largely used in the early years of milk production.

Aerators.

Aerators are of two types:—

(1) Rectangular trays, set in a metal frame, adjusted to an angle of approximately 15 deg. with perforations at the lower end. The milk runs down one tray, falls to the next, runs down this tray in the opposite direction, and so on over five trays and then into the can.

(2) Circular dishes, with perforated bottoms, held in a metal frame. The dishes are approximately 12 inches in circumference with a distance of from 6 to 8 inches between each of the four or five dishes.

The advantages of aerators are their low cost, ability to effect a partial removal of feed flavours, and limited cooling of milk to within a few degrees of atmospheric temperature. The disadvantages, which outweigh the advantages, are:—(*a*) ability to cool only to within a few degrees of atmospheric temperature, which may be as high as 90 deg. F. in summer time; (*b*) number of dishes and trays to be cleaned and sterilized (*c*) picking up of dust during cooling operations, and (*d*) tendency to dust contamination unless sterilized immediately prior to use.

In addition to the two types described above, there are the undermentioned inefficient methods of atmospheric cooling which, in some cases, have been temporarily employed pending the installation of a more efficient system.

Drop Cooling.

This method consists of slowly running the milk from the vat into a small container (usually a tin) with perforated bottom, thus breaking the milk up into fine streams which then fall into the strainer on top of the can.

Tray Chute Cooling.

In this method the milk is gravitated from the vat along a tinned-steel chute into a tray placed over two or more cans. In the bottom of the tray are holes which direct the milk into the cans. These two systems, which have no advantages and many disadvantages, cannot be recommended even as a temporary measure.

Water Cooling.

Coolers which employ water as the cooling medium are of three main types:—(*a*) trough; (*b*) beehive; and (*c*) tubular.

Trough Cooling.

Trough cooling is the standing of cans of milk in a concrete, wooden or metal trough filled with cold water at least to the level of the milk in the cans. Disadvantages are the necessity for repeated stirring of the milk and water and for regular changing of the water, limited cooling efficiency and time taken to cool the milk. Where unlimited water supplies are available, making it possible to circulate water through the trough, this method is efficient. In most Queensland dairying districts it is not, however, practicable to circulate water through the trough.

Beehive Type Cooler.

These coolers, which have been in use for some years, are cone-shaped, with corrugated sides, and have a perforated metal top to distribute the milk and an attached tray at the bottom to direct the milk to the can. The water capacity of beehive type coolers on the market ranges from 4 to 20 gallons. They are usually fitted with a plunger to stir the water during cooling. This type of cooler is very unsatisfactory, the major disadvantages being:—(*a*) limited cooling efficiency due to inadequate water supply and the warming up of the water in the cooler during the cooling process: this disadvantage has been overcome in some cases by circulating water through the cooler during the periods of use; (*b*) necessity for emptying the cooler daily to prevent the water becoming stale; (*c*) necessity for emptying the cooler before washing or sterilizing to ensure efficient sterilization; (*d*) large surface of cooler to be cleaned; and (*e*) possibility of contamination by dust between milking periods.

Tubular Water Coolers.

Tubular water coolers are the most popular and efficient type of water cooler available. Several makes are on the market. Cold water enters the bottom of the cooler, passes through a continuous tube backwards and forwards across the cooler, and finally leaves the top. The milk, which passes over the outside of the cooler, is cooled by the circulating water inside the cooler. Tubular water coolers are grouped as one class for comparison with other types of coolers, but the different kinds will be further compared in accordance with the types of water cooling systems adopted.

The following table shows the relationship between milk and water temperatures, rates of flow of milk and water, and gallons of water per gallon of milk in some of the tubular water coolers checked in both summer and winter.

Month.	Temp. of Milk in Vat. °F.	Temp. of Milk in Tray. °F	Temp of Milk in Can. °F.	Atmos. Temp. °F.	Temp. of Cooling Water. °F.	Rate of Milk flow; gallons per hour.	Rate of water flow; galls. per hour.	Gallons water per gall. Milk.
Jan. ..	99	87	87	92	81	60	180	3
Dec. ..	98	85	84	86	81	50	240	5
Nov. ..	96	79	78	72	75	50	240	5
Oct. ..	93	74	73	72	70	40	240	6
Feb. ..	99	80	80	92	78	60	360	6
Nov. ..	95	77	76	74	74	30	240	8
May ..	92	65	65	68	63	20	200	10

Provided that the rate of water flow per gallon of milk is sufficient, milk temperature can be reduced to within 2 deg. F. of the water temperature. In addition to efficient cooling, the milk is also aerated. Although the cost of installing a good tubular water cooler is higher than that of an aerator, the producer is more than compensated by improved quality.

Tubular water coolers should be so constructed that they are easy to clean; all corners should be rounded and top and bottom trays detachable. The cooler should be suspended from an iron bracket or frame to facilitate cleansing procedures. Particular care should be taken to see that the cooler is level to ensure an even distribution of milk, as this results in more efficient cooling.

Plate 130.
GRAVITY FEED SYSTEM OF WATER CIRCULATION FOR TUBULAR WATER COOLERS.

Systems of Water Circulation for Tubular Water Coolers.

An efficient means of circulating the water used with water coolers is essential to their success. The methods employed are of two kinds—(*a*) gravity feed, and (*b*) mechanically operated force feed.

(*a*) Gravity Feed System (Plate 130).—The earliest method of water circulation was provided by a 40-gallon porous earthenware drum, which was placed on a stand above the level of the cooler. Water flowed through the cooler and discharged into another drum on the floor. This water was then pumped back into the top drum by a semi-rotary hand pump and the cycle continued. Only rain water could be used in the porous earthenware drum or the pores became clogged and cooling of the water (by evaporation) was reduced. Some years ago milk condenseries on the Downs supplied ice for cooling the water and these systems were satisfactory up to a certain point, but then efficiency was limited by the small quantity of water available.

This type of cooler can still be recommended for small hand-milking farms with a limited quantity of milk, but the water must be changed frequently and the earthenware drum maintained in a clean condition.

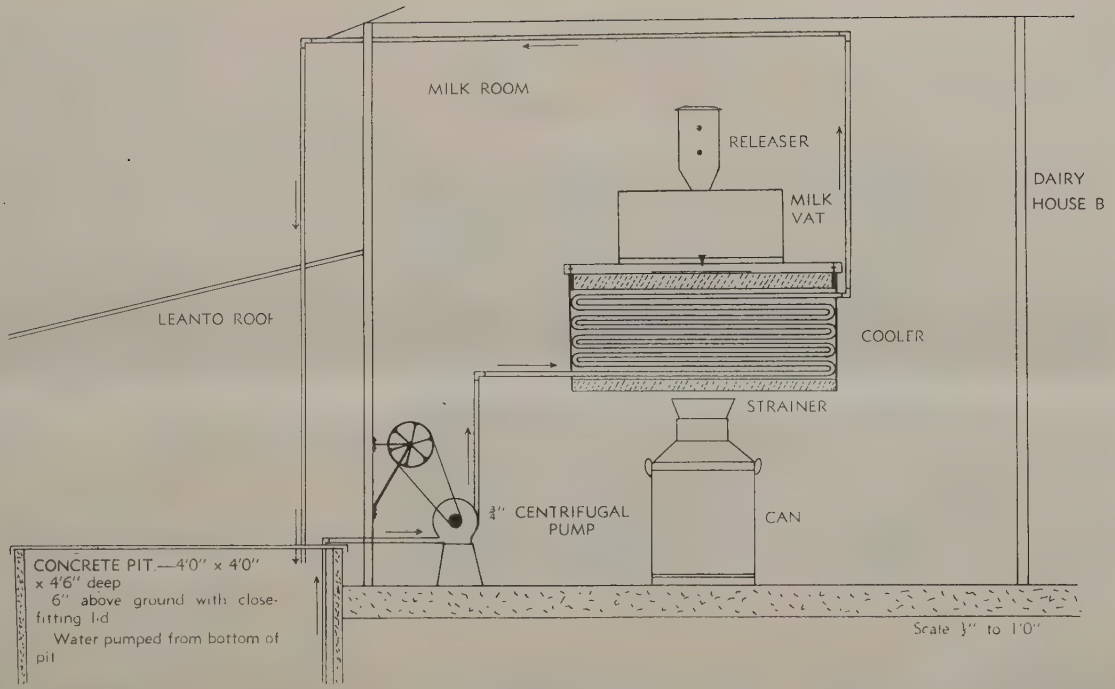


Plate 131.

DIAGRAM OF A MECHANICALLY OPERATED FORCE FEED SYSTEM OF WATER CIRCULATION FOR TUBULAR WATER COOLERS.

A more recent development in gravity feed for water coolers has been the supply of water from overhead bore tanks, with the overflow being piped away to stock troughs, or, as in several cases, to vegetable gardens nearby. The efficiency of this system is limited in summer by the temperature of the water. Water in open bore tanks (and in long lengths of pipe line) rises in temperature and in one case was 78 deg. F. in the main bore tank (3,000 gallons capacity). Working at peak efficiency, the milk temperature can only be lowered to approximately 80 deg. F. and this is too high a temperature at which to hold milk. Pipe lines should be underground and not on the surface.

In an endeavour to overcome the high temperature of water in bore tanks, some producers have arranged for water to be supplied direct from the bore, but this is only possible when the bore is adjacent to the dairy.

One supplier in the Maclagan district has an underground concrete tank for bore water on the hillside above the dairy. Water is piped direct from this tank through the water cooler and results are very satisfactory.

Gravity-fed cooling systems are only recommended for hand-milking farms.

(*b*) Mechanically operated force feed systems (Plate 131) :—

These systems of water circulation can only be adopted where milking machines are in operation. They consist of a water-pump, driven by an engine, and water supplied from either an underground tank or a overhead tank. Both ½-inch and ¾-inch rotary pumps and geared pumps are suitable for the purpose. At least 6 to 10 gallons of water per gallon of milk are required to cool the milk efficiently, the ratio varying with the flow of milk per minute, which in turn is affected by the number of units milking, fresh cows, &c.

In pressure systems of water circulation it has been found that a ¾-inch rotary pump is adequate for all needs. Frictional losses vary with different coolers and the revolutions per minute will have to be varied accordingly to maintain an adequate water flow in relation to milk flow. Half-inch geared pumps are rated to deliver 200 gallons of water per hour through milk coolers having ½-inch or larger intake and outlet at 400 revolutions per minute, while ¾-inch geared pumps deliver 250 gallons per hour at the same speed. Higher quality geared pumps working at 800 revolutions per minute operate as follows:

½-inch pump	360 gallons per hour.
¾-inch pump	540 gallons per hour.

The best systems of water cooling by mechanically operated force-feed pumps are from underground concrete tanks adjacent to the dairy and of from 400 to 600 gallons capacity. These tanks are usually square or rectangular, and at least 9 to 15 inches out of the ground to prevent contamination from surface water. The tank must be covered with a close fitting lid, through which the intake and outlet pipes pass.

Although an uncovered tank will result in a more rapid drop in water temperature due to evaporation, it is necessary to have a close fitting lid to keep dust, frogs, &c., out of the water. It is advisable to have a roof over the tank in addition to a lid. Many of these water systems are in operation on the Darling Downs and, even during summer,

water temperatures do not rise much above 70 deg. F. Although the water temperature rises 4 to 6 deg. F. during the milking operations, it falls again before the next milking.

Another type of underground tank can be constructed from a 6-feet length of 4 feet diameter concrete pipe, provided with a concrete bottom, placed vertically in the ground.

In all cases of underground tanks it is essential to chlorinate the water at the rate of 3 to 5 parts per million when the tank is filled and to replace the water every three months.

Many suppliers pump water direct through the cooler from an adjacent rain or bore water tank; the main objection to this system is the high water temperature in summer. One supplier has overcome this objection to some extent by covering the tank from the direct rays of the sun.

Although tubular water coolers as supplied by several firms in Queensland are the most popular type of water cooler, some mechanically-minded suppliers have devised an alternative type, the main advantage of which is the fact that it can be installed in dairies where the drop from the releaser of the milking machine to the milk can is too small to allow the installation of a tubular water cooler. This particular cooler is made in the style of a wide chute with corrugated double bottom and 3-inch sides. The milk runs down the sloped cooler and is cooled by water passing up through the double bottom. The coolers are usually 2 ft. 6 in. to 3 ft. long by 12 to 15 in. wide, but are not as efficient coolers as the tubular type, which have twice the cooling area (two sides of cooler).

Refrigeration.

The principle of refrigeration has not yet been applied to milk cooling on the cheese-milk producing farms in Queensland, although it is fairly popular in some areas for cream cooling, and is used to a limited extent for cooling milk supplied for the fluid milk market. The over-all cost of refrigeration is too high to warrant its installation for cooling of milk supplied to cheese factories, but refrigerator units should prove of great value in the future for the cooling of milk for human consumption. By this method milk may be cooled to a temperature low enough to almost completely suppress bacterial action.

GENERAL OBSERVATIONS.

It is necessary to view the application of the various types of coolers from the point of view of the method of milking. On farms using milking machines, the necessary power is available to drive a centrifugal or geared pump, and the installation of a tubular type water cooler, with cooling water provided from an underground concrete tank or pit of from 400 to 600 gallons capacity, is advised. Farms on which hand milking is practised do not have the necessary power available, and are recommended to instal a tubular type water cooler, supplied with cooling water from an overhead earthenware container or direct from the bore, if available.

Cooling should be applied to both morning and night milk. It is a common practice to cool only the night milk and deliver the morning milk in a warm condition. The reason given is that the night milk is

held for a much longer period on the farm and, unless cooled, deterioration will result, whereas the morning milk is held for a short period and the chances of deterioration are considerably less. This is partly true, but it must be remembered that bacterial development is rapid in uncooled milk; and, although the milk may be acceptable to the management, deterioration is already taking place.

Where the temperature of water-cooled milk is lower than atmospheric temperature, the night milk should be held in full-can lots, as the greater quantity of milk will give a slower rise in temperature than would be the case if stored in half-can lots. When full-can storage is applied, the can lids may be placed on to avoid atmospheric contamination. In the case of atmospheric cooling the night milk should be stored in the cans in four to five gallon lots and the milk stirred as often as is practicable.

It is necessary to store milk in an approved type of milk stand and to see that adequate protection is provided against the rays of the early morning sun. Care should also be taken to see that milk is transported rapidly to the factory and protected from the sun's rays while in transit.

A number of cheese factories in the State now grade and pay for milk on its methylene blue test, and cooling of milk assists in attaining the necessary standard. The delivery of inferior milk seriously affects cheese manufacture and results in not only a low grade article, but also in reduced yields of cheese. The desirability of completing the cooling operation *immediately* after the milk is drawn from the cow, of reducing the temperature to as low a degree as possible, and of storing the milk in cool surroundings, is stressed.

Efficient cooling of milk will undoubtedly assist in improving the quality of milk. Suppliers must not, however, accept cooling as an alternative to proper cleansing and sterilizing of dairy utensils, but as a necessary adjunct thereto.

THRESHED PEANUT HAY FOR DAIRY COWS.

The results of feeding trials in America, and reported in a recent issue of the American *Journal of Dairy Science*, should be of interest to Queensland dairy farmers in peanut-growing districts. The object of the trials was to compare the feeding value for dairy cows of cured peanut vines, commonly known as threshed peanut hay. The comparison was made between peanut hay and lucerne hay.

Two groups of cows were fed the two types of hay, and after a time each group was switched over to the alternative kind of hay—that is, the cows which commenced on peanut hay were changed over to lucerne hay, and *vice versa*. In each trial a good grade of peanut hay, which was of green colour and very leafy, was compared with lucerne hay of corresponding quality. In addition to the two kinds of hay, the cows were fed a concentrate ration consisting of yellow corn, ground oats, bran and cotton-seed meal, and a small addition of salt.

The results of the experiment showed that threshed peanut hay of good quality is equivalent in feeding value to lucerne hay of similar quality.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which qualified for entry into the Advanced Register of the Herd Books of the A.I.S., Jersey, Guernsey, and Ayrshire Societies. Production records for these have been compiled during the month of August, 1945. (273 days production unless otherwise stated.)

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Alfa Vale Model 24th	W. H. Thompson, Nanango	9,110·9	364·043	Alfa Vale Pat
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Glen Idol Lovely 4th	Estate P. Doherty, Gympie	7,052·85	278·231	Blacklands Count
Rhodesview Kitty 22nd	W. Gierke and Sons, Helidon	6,124·85	263·056	Blacklands Prospector
Rhodesview Biddy 27th	W. Gierke and Sons, Helidon	5,144·9	252·624	Fairvale Major
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
College Stately 20th	Queensland Agricultural High School and College, Lawes	7,126·5	285·578	Alfa Vale Pride 3rd
College Flash 9th	Queensland Agricultural High School and College, Lawes	7,192·95	278·268	Alfa Vale Pride 3rd
Glen Idol Daphne 12th	Estate P. Doherty, Gympie	7,311·2	272·978	Blacklands Banker
Glen Idol Laurel	Estate P. Doherty, Gympie	6,830·2	270·625	Blacklands Banker
Navillus Violet 13th	C. O'Sullivan, Greenmount	7,340·5	266·366	Parkview Limerick
JERSEY.				
MATURE COW (STANDARD 350 LB.).				
Peeramon Fairy Dove	N. Harris, Ravenshoe	8,116·55	421·853	Trinity Popcorn 2nd Pioneer
JUNIOR, 4 YEARS (STANDARD 310 LB.).				
Trecarne Alleenette	P. H. Schull, Oakey	6,231·	324·259	Trecarne Some Duke
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Wyreema Silver	H. T. W. Barker, Oakey	5,610·6	323·61	Navua Bonpelliers Lad
Glenrandle Fairette	P. Kerlin, Killarney	5,261·2	304·398	Bellgarth Stylish

JUNIOR, 2 YEARS (STANDARD 230 LB.).

Mayfair Star 3rd	J. W. Carpenter, Junr., Helidon	5,298·6	316·144	Trecarne Golden King 2nd
Kathleigh Royalette 2nd	W. Muller, Marburg	5,703·	294·38	Oxford Daffodils Victor
Woodview Lima	P. H. Schull, Oakey	5,217·6	288·311	Trecarne Royal Officer
Woodview Charm	P. H. Schull, Oakey	4,412·25	243·833	Trecarne Royal Officer

GUERNSEY.

MATURE COW (STANDARD 350 LB.).

Laureldale Dot	W. A. K. Cooke, Witta	7,373·06	396·086	Laureldale President

SENIOR, 3 YEARS (STANDARD 290 LB.).

Linwood Sister	A. S. Cooke, Witta	8,992·25	452·301	Laureldale Peaceboy

JUNIOR, 3 YEARS (STANDARD 270 LB.).

Linwood Bridesmaid	A. S. Cooke, Witta	6,956·5	361·56	Warrawong Winter

JUNIOR, 2 YEARS (STANDARD 250 LB.).

Linwood Gay Lady	A. S. Cooke, Witta	5,719·5	305·531	Warrawong Winter

AYRSHIRE.

MATURE COW (STANDARD 350 LB.).

Crescent Farm Joyce 2nd	N. J. Mann, Broxburn	10,494·66	398·047	Crescent Farm Prides Odin

GENERAL NOTES

Staff Changes and Appointments.

Mr. J. E. Tesch, B.Sc. (Agric.), Q.D.A., A.A.C.I., has been appointed Assistant Mill Technologist, Bureau of Sugar Experiment Stations, Department of Agriculture and Stock.

Mr. R. W. Butler, B.V.Sc., has been appointed Assistant Veterinary Officer in the Division of Animal Industry, Department of Agriculture and Stock, and has taken up duty at the Animal Health Station, Yeerongpilly.

The Minister for Agriculture and Stock, Mr. T. L. Williams, has announced that, in pursuance of policy designed for the allocation of advisers in various branches of his Department to Central and Northern Queensland, it has been approved that Mr. J. J. McLachlan, Adviser in the Poultry Branch, be transferred from Brisbane to the Townsville-Cairns district, with headquarters at Cairns; and Mr. T. Hallick, Poultry Inspector, from Brisbane to Rockhampton-Mackay district, with headquarters at Rockhampton. In view of the expansion of the poultry industry in this State it is considered, said Mr. Williams, that advice should be available through more direct channels to poultry-raisers in the Central and Northern divisions of Queensland.

Plague Grasshoppers.

An Order in Council has been issued under *The Plague Grasshoppers Extermination Act of* 1937, declaring the Shire of Ayr to be a district under and for the purposes of the abovementioned Act.

Introduction of Mandarins—A Precautionary Measure.

A proclamation has been issued under the *Diseases in Plants Acts* prohibiting the introduction into Queensland of mandarin trees or buds of the Emperor variety from New South Wales and Victoria, unless accompanied by certificates signed by the grower and an inspector to the effect that such trees or buds are free from the disease known as brown spot of mandarin.

Seeds Regulations.

The Seeds (Certified Hybrid Maize Seed) Regulations of 1945, which are designed to control the production of hybrid maize, have been approved under *The Seeds Acts*, 1937 *to* 1941.

Rationed Poultry Foods.

The Minister for Agriculture and Stock, Hon. T. L. Williams, has announced that because of the existing shortage of crude protein meals, bran, pollard, and commercially prepared mashes it has been found impossible to make these products available for the feeding of chickens, ducklings, or any additions to existing flocks. Keepers of poultry who have been furnished with coupons or permits to obtain supplies of the products mentioned and who desire to increase their flocks should provide for the feeding of the young birds by culling out the least profitable of the old. No additional allowance of these rationed foods can be made to provide for the feeding of fresh stock.

Supplies of these foods are not available to persons who were not keepers of poultry on the 28th February last to commence poultry raising.

Rural Topics

The Country Women of Queensland.

Probably no section of the community can show a finer record, especially during the war, than the country women of Queensland. That was abundantly evident at the recent annual meeting of the Country Women's Association in Brisbane, at which many of the fine things done during the year were reported. Not only that, but well-thought-out plans for carrying on the good work in the present year were outlined. Included in various plans and projects is the establishment of hostels for youngsters from outlying districts, so that they may attend the nearest secondary schools and have other higher educational advantages which all should have in a well-balanced country life.

Actively associated with the Australian Comforts Fund, Red Cross, and other patriotic bodies, members found time to provide seaside holidays for mothers and their families who came from places far inland, and who, otherwise, would have had little, if any, opportunity, especially during wartime, of coming down to the coast for a well-earned change.

In its proposals for the expansion of its activities, particularly in regard to the provision of modern amenities—especially cheaper refrigeration—in country homes and community centres, the Country Women's Association will surely have the substantial support of Queenslanders generally.

Food Comes First.

Queensland farmers established a new record for the area of land under cultivation in the year ended on the 30th June. This great record was achieved in the face of many difficulties—including an erratic season, a heavy lag in farm maintenance, because of the absence of so many young farmers and farm workers in the Fighting Forces, and other national services. Only three out of every hundred of those who had been on full-time farm work before they joined up had been released from the Services, and they did not come back all at once either. It would be interesting really to compare the farmers' record of production with other industries under wartime conditions.

Another good record was put up by dairy farmers supplying cheese factories. The Queensland cheese objective for the year was 10,000 tons and the tonnage actually produced was well over that target.

A Word for the Working Dog.

As every country man knows, the working dog well earns his keep (without having to be paid overtime, either) whether on the farm or on the road with stock.

It is a peculiar thing, but the most successful dog men are, as a rule quiet coves who never get hot and bothered or bustled when working their dogs. They look after their dogs, feed them well, talk to them when they think they need a little attention—and what dog does not, especially in scrub-ticky country. It is to be admitted that some who make their living droving, as well as otherwise working stock, too often neglect to give their dogs a fair spin. If dogs are starved they cannot be expected to turn out day after day at mustering or dipping time, or when working in a stock yard, with scarcely a decent feed. No dog, of course, can work properly without feeding; the dog that is underfed never has the strength to see the day out, for stamina is not in him.

Most drovers look after their dogs well, knowing what it is to be without a good dog on the road. If meat happens to be light on, a bit of bread dipped in fat will keep Old Bluey going for awhile; and if he's sore-footed, he has possibly picked up a bindeyi or two or his feet otherwise need attention.

We all know stockmen who never give their dogs a hiding, yet get them to do amazing things when working stock in the paddock or in the yard or along the road, and those things are done just through kindness and keeping the dogs fit and in good spirits. To see a good dog at work is a delight, and he is worth a pat on the head, a drink from the water bag and, of course, a banjo of mutton.

Quality for Export.

With the end of the war has come the necessity of giving more attention to the quality of export products. While the war was on, quality often had to be placed second to maximum production, and bulk may have to beat quality for some time yet, but, no matter how gradually, the time will come again to concentrate on quality as against weight of shipments—perhaps more so than ever before. It will be necessary, no doubt, to look round for more markets in which quality will be the best selling point. For instance, at present, as during the war, the demand is for bacon weight rather than for bacon quality. Take the British market for dairy products—the time will come again when the housewife will have the right to say what she wants, and our production and marketing plans will have to be moulded accordingly. How long it will be before the customer will have the right to call the tune again—a right which will be exercised with sparkling eyes and great enthusiasm—is not known yet, but, in the meantime, it would be worthwhile concentrating on quality production. There are still three years of the food contract with the United Kingdom to go, but even before then the customer may want to dictate to the supplier. Quality, the maintenance of the highest quality in our export products will obviously be to our marketing advantage. And among the best ways of exporting Australian quality is to put it in a side of bacon or into a butter box.

On Buying a Dairy Herd.

Many of the men who are back or on their way back from the war will plump for farming as, for them, the best way of making a living, as well as the best way of life. For a lot of them, dairy farming will be the best bet, so a few points on getting a dairy herd together will not be out of place.

The first big point is that a healthy herd spells high production, so it is of great importance that every cow in view should have passed the tuberculin test and be otherwise disease-free, especially from contagious abortion and mastitis.

It sometimes happens that a cow has passed a tuberculin test on one occasion, but has re-acted on another. Therefore, the purchaser should make sure on this point before using such an animal for breeding purposes.

Every breed of cattle possesses its own distinctive features, or characteristics, and although they may be more or less subdivided, there is, nevertheless, broadly speaking, a distinctiveness in type in every breed which is as near the "ideal" as has yet been reached, and at which every breeder should at least aim as his objective.

While in some ways it is an advantage to commence with a young bull and some good heifers, there is, on the other hand, much to be said in favour of trying to get a bull which has already done good work in a herd, and also of some cows which likewise have proved their worth. Having acquired the nucleus of a herd, it is up to the owner to keep in mind the particular type of animal he favours and to try, as far as he can, not only to stick to such type, but to try and improve on it. Any district dairy adviser will be willing and happy to give a prospective dairy farmer the benefit of his experience and knowledge (as would also any experienced dairy farmer in his locality) to a returned soldier settler.

"Strawberry's" Win.

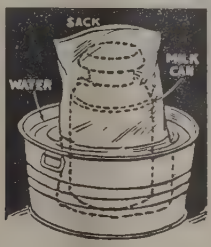
Here's a good story from Victoria: When the Victorian Department of Agriculture was stocking its Better Farming Train (a travelling demonstration outfit running regularly through rural districts) an ugly old scrub cow was chosen to contrast with a well-fed, shiny-coated, purebred with a pedigree as long as a slip rail. The idea was to show how much less milk the "mongrel" gave on the same feed—same in quality and quantity. At the commencement of the tour, "Strawberry," the misbegotten cow, showed in the bucket how badly she had been fed, while her purebred rival filled the bucket to overflowing. As the tour proceeded, "Strawberry" responded so well to the good tucker that she was giving more milk than the pedigreed pet.

The astonished dairy demonstrators quick-wittedly changed their tune, and instead of contrasting the cows on the score of breeding and conformation, they used the scrubber to show that a good cow may not be picked on appearances alone, and that feeding is often the key to higher yields.

"Strawberry" won and pointed a moral with her win, and the moral is that a cow "milks through the mouth"—that is, production depends on feeding and that a good dairy farmer gives close attention to the establishment and management of his pastures.

GADGETS AND WRINKLES

MILK CANS COOLED BY WATER.



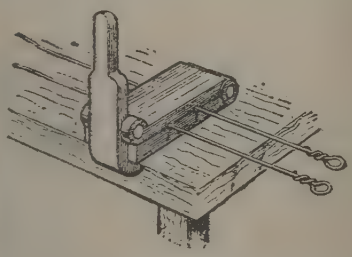
Cans of milk or cream left at a pick-up point on the roadside can be kept cool by setting the cans in tubs of water and slipping wet sacks over them. The wet sacks act as wicks in the water, which is evaporated from the bag and cools the cans. This idea may also be used where no other cooling system is available for cream.

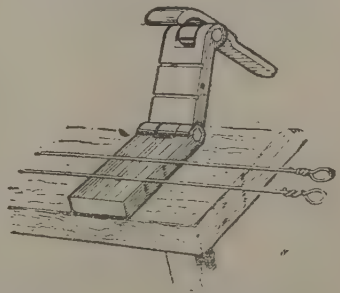
AIR CLEANERS AND TRACTORS.

Precautions in keeping air cleaners on tractors in good condition is important in getting proper results from the machine. A neglected air cleaner will soon result in a badly worn motor and it will fail to perform efficiently after the air cleaner becomes clogged with dirt. The oil bath in the cleaner cannot function successfully unless it is clean. Most tractor companies recommend changing the oil every 10-hour day. Power has been increased 22 per cent. and fuel consumption decreased 13 per cent. according to tests at the university laboratory on a tractor after the air cleaner has been put in proper condition.

RE-USING BALING WIRE.

Chopping through the wires on hay or straw bales is a time-saver, but wire of any sort is scarce. To-day it is worth spending an extra half-minute undoing the wire with a pair of pliers to save it for re-use. Straightening used baling wire is not very difficult. The old method of pulling through grooves cut in a vice is slow





compared with the use of the simple device illustrated, which consists of a hinge fitted with a lever and grooved to form a tube, when closed, the same gauge as the wire. The lever holds the hinge in place, while the wire, gripped in a pair of pliers, is drawn through the grooves.

Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

SUMMER CLOTHES FOR THE TODDLER.

SUMMER time is coming along fast and mothers will be planning the children's wardrobes. Nowadays, there is no difficulty about dressing a toddler and making this important small person look delightful as well as comfortable.

It should be remembered that young limbs require freedom for movement and growth, and that the eyes and minds of the young enjoy bright colours and the feeling that they need not take too much care of their clothes, but can enjoy a game in soil, sand or water, with the knowledge that if the game proves too messy, a visit to the wash tub will soon set things right for both themselves and their clothing.

Even in sunny Queensland, hard and fast rules about the month in which to get out muslin frocks cannot be laid down, and so, day by day, it is necessary to be ready for any emergency in the way of a change of temperature and have something to slip on or off the toddler as the necessity arises. The ideal state is that a child should be both comfortable and happy in his clothes; he will be neither if too hot or too cold. A child who is too warmly or heavily clothed soon becomes tired and listless. On the other hand, one that is often cold because the mother thinks the youngster looks attractive in tiny skirts or abbreviated knickers that leave exposed a large part of the legs and thighs is often fretful and may start what used to be known as "growing pains" but what we now recognise as the beginning of infantile rheumatism. Mothers have no right to sacrifice their children's comfort and health to their own vanity.

Cost of Clothes.

The cost of toddler's clothes has to be considered carefully if incomes are limited. It should be borne in mind that children from two to five grow remarkably quickly and clothes made for one season will probably be outgrown by the next. So it is not wise to make more than are actually needed at the time. Summer clothes need not be expensive. Nothing looks nicer than washing cottons for warm days and these can usually be obtained in attractive colours and designs. An extra woolly cardigan and a light coat for outdoors on the odd cool or damp day completes the summer outfit. This can be still further decreased in really hot weather until only a sun suit and sun hat complete the kit.

Hats in Summer.

The modern habit of children going without hats presents some difficulties, especially in a hot climate. Little children are seen walking about or riding in their strollers with their eyes screwed up to keep out the glare as though it caused pain or at any rate acute discomfort. When the day is both bright and hot, the sun on the back of the neck can have injurious effects. This may not be apparent

immediately, but headache or a light form of sunstroke may appear at the end of the day. It is *always* wise to give children a large linen or straw hat for the summer to protect the eyes, the back of the head and nape of the neck, as well as the top of the spine. These are the most vulnerable parts. Another essential word of warning is about the wearing of sun suits without any preparation. We often find that a child is allowed out in his new sun suit on the first hot day of the year, and soon becomes badly sunburnt. Sun baking should be introduced very gradually and before the sun gets too hot.

Tight Clothes.

Another warning is about clothing that is too tight. Mothers should be specially careful about the waist line, armholes, neck and round the thighs and buttocks so that little garments allow freedom of movement, and comfort. Tight clothing can cause faulty posture and some risk to health as well as to temper. It is wise to allow for some increase in the waist line after a meal. In the case of two- or three year-olds this may be considerable.

Further advice and patterns of toddlers' garments may be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 *St. Paul's Terrace, Brisbane*, or by addressing letters *"Baby Clinic, Brisbane."* These letters need not be stamped.

IN THE FARM KITCHEN.

Fritters and Pancakes.

Pancakes.

Take 8 oz. flour, 3 oz. sugar, 2 eggs, ½ pint milk, 1 teaspoon of baking powder, and a pinch of salt. Mix the flour, baking powder, sugar, and salt. Beat the eggs well and stir into the flour, and so on. Add the milk in small quantities, beating well. Drop spoonfuls on to a hot greased girdle or pan. When bubbles appear on the surface of the pancakes turn them over with a knife and brown the other side. When done, place on a clean teacloth and cover with another to cool.

Dumplings.

Dumplings are always acclaimed by the young people, especially on a cool day, and they may be added to either a beef or a mutton stew. To make them, use ½ lb. flour, 3 oz. dripping or butter, a little salt, a small teaspoon of baking powder, and moisten with milk or water or with a mixture of milk and water. Break off pieces of the dough, roll them into balls and drop them into the stew about half an hour before it comes to table.

Pancake without Eggs.

Ingredients: Quarter lb. flour, a pinch of salt, ½ level teaspoon of bicarb. soda, ½ pint milk, 1 dessertspoon vinegar, fat for frying. Sift the flour into a basin with salt and soda. Make a well in the centre, stir in half or two-thirds of the milk. Beat well for a few minutes, then stir in the remainder of the milk by degrees. Add salad oil or melted butter. Let stand for an hour or longer, then add the vinegar. Mix thoroughly and fry in the usual way. Sprinkle with sugar, roll, and serve hot.

Cheese Fritters.

Boil 1 cup of milk with 1 shallot (finely chopped). Fry 1 oz. flour in 1 oz. butter, just enough to cook it without browning. Stir in the milk, let it come to the boil while stirring, season with a pinch of cayenne and a very little nutmeg, and cook slowly until it resembles a batter in consistency. Build the mixture with the yolks of 2 eggs. Add 1 oz. grated cheese and spread on a dish or baking sheet, previously buttered to cool. Cut out some rounds by means of a cutter and beat up the egg whites to a stiff froth. Mix 1 oz. grated cheese with 1 oz. breadcrumbs. When set, egg and crumb them. Fry in very hot fat. Drain carefully and dish up.

Pumpkin Fritters.

After cooking the pumpkin and drying the pulp as well as you can, measure a pint of it. Mix with this a tablespoon of flour, 2 tablespoons of sugar and a little milk. Beat all together, and then add a few drops of lemon flavouring and 1 egg. Beat well together again, and fry in spoonfuls. On serving, sprinkle with sugar mixed with cinnamon.

ASTRONOMICAL DATA FOR QUEENSLAND.

NOVEMBER, 1945.

Supplied by the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	4.59	6.05	Cairns	46	11	Longreach	42	28
6	4.55	6.09	Charleville ..	29	25	Quilpie	33	37
11	4.52	6.12	Cloncurry	61	38	Rockhampton ..	17	3
16	4.50	6.16	Cunnamulla ..	28	31	Roma	18	15
21	4.48	6.20	Dirranbandi ..	17	21	Townsville	37	12
26	4.47	6.24	Emerald	26	13	Winton	49	31
30	4.46	6.27	Hughenden ..	46	24	Warwick	3	5

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	a.m.	p.m.
1	3.03	2·53
2	3.34	3.45
3	4.05	4.37
4	4.35	5.28
5	5.06	6.20
6	5.40	7.14
7	6.17	8.08
8	6.57	9.02
9	7.42	9.55
10	8.31	10.46
11	9.24	11.35
12	10.22	..
		a.m.
13	11.22	12.20
	p.m.	
14	12.23	1·02
15	1.26	1.42
16	2.29	2.21
17	3.35	2.59
18	4.43	3.39
19	5.53	4.21
20	7.03	5.07
21	8.12	5.59
22	9.17	6.55
23	10.16	7.55
24	11.07	8.57
25	11.52	9.58
26	..	10.57
	a.m.	
27	12.31	11.54
		p.m.
28	1.05	12·48
29	1.37	1.41
30	2.08	2.32

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27 ; Cunnamulla 29 ; Dirranbandi 19 ;
Quilpie 35 ; Roma 17 ; Warwick 4 .

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	16	21	31	38	7	12	36	43
6	25	13	41	28	16	3	47	32
11	28	12	44	26	19	1	52	29
16	20	17	36	32	11	8	42	37
21	11	27	26	43	1	18	29	51
26	14	25	29	41	4	17	33	49
30	19	19	35	34	10	10	40	39

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	21	34	45	54	30	39	19	29
3	30	25	51	47	35	32	25	22
5	39	16	56	42	41	27	33	16
7	47	9	62	37	47	23	38	10
9	51	5	65	34	49	20	42	7
11	51	7	65	36	49	21	42	8
13	46	9	61	37	46	23	37	10
15	37	18	55	43	40	28	31	17
17	25	29	47	50	32	35	22	25
19	13	40	40	57	25	42	14	34
21	7	48	36	62	21	48	8	40
23	7	51	36	64	21	50	8	43
25	12	47	39	62	24	47	12	39
27	15	40	41	57	26	42	15	34
30	29	31	50	51	35	36	25	26

PHASES OF THE MOON.

New Moon, November 5th, 9.11 a.m.; First Quarter, November 13th, 9.34 a.m.; Full Moon, November 20th, 1.13 a.m.; Last Quarter, November 26th, 11.28 p.m.

About November 16th the Sun will rise and set 20 degrees South of true East and true West respectively. On November 17th the Moon will set at true West and on November 30th will rise at true East.

Venus.—This planet in November, will rise, from Queensland generally, between 3.45 a.m. and 4.45 a.m., and will be visible low in the east during morning twilight.

Mars.—At the beginning of this month Mars, in the constellation of Cancer, will rise about midnight about 25 degrees North of true East. At the end of the month it will rise between 10.15 p.m. and 10.45 p.m. about 23 degrees North of true East.

Jupiter.—Now a morning object in the constellation of Virgo. Jupiter at the beginning of the month will rise between 3.45 a.m. and 4.45 a.m. about 5 degrees South of true East. At the end of the month this planet will rise between 2 a.m. and 3 a.m. about 10 degrees south of true East.

Saturn.—In the constellation of Gemini, Saturn, at the beginning of the month will rise about midnight and at the end of the month will rise between 9.30 p.m. and 10.30 p.m. about 23 degrees north of true East.

The Year.—In order to determine the period of revolution of the Earth round the Sun, it is necessary to adopt a point of reference for the starting and finishing of each revolution. Three different starting points are used for this purpose, giving the following different years: (1) The Sidereal Year, in which the stars are used as a basis of measurement. It is the interval between the Earth's position in relation to the stars at any chosen time of the year and the next return of the Earth to that position. This takes 365.25636 days and after each complete revolution the Sun returns to exactly the same position among the constellations. (2) The Anomalistic Year, which is the interval between successive annual returns of the earth to the point defined as Perihelion. (The point in its orbit at which the Earth is nearest the Sun.) This takes 365.25964 days to complete one revolution. (3) The Year on which our calendar is based, known as the Tropical Year. The starting point of this year is the position of the earth in its orbit at which the Sun, when changing from a Southern to a Northern declination, shines directly over the equator. It is the intersection of the equator and the eclipse and the point of intersection is called the "First Point of Aries." A complete revolution in this year takes 365.24219 days and the relation to the fixed stars is different at each return of the earth to any particular point in its orbit. Thus at the commencement of each year the Sun appears displaced a further 50.2 inches of arc along the ecliptic. In nearly 4,000 years the "First Point of Aries" has passed through the constellation of Aries and almost through the next constellation Pisces. One feature about the tropical year, however, is that the seasons always bear the same relation in time to the beginning of the year and among peoples whose existence depends upon seasonal changes this was the year most suited as a base for calendars.

QUEENSLAND WEATHER IN SEPTEMBER.

Thunderstorm rains with local hail, mainly on the 18th and between the 22nd and 25th, brought fairly useful to over average aggregate totals in most of the Central East Coast and South Coastal districts, with the best average distribution of approximately 2½ inches in the Port Curtis areas. The eastern half of the Central Highlands and north-east Downs also benefited, but the Darling Downs West however only averaged less than half an inch. Fair to good seasonal conditions were still being maintained for most farming operations and wheat harvest prospects were bright. Over the rest of the State however, apart from local coastal showers, little or no rain was recorded, with *many nil registrations* in the western half. During July, apart from the far West Border and lower Carpentaria, "there was a general moderate to good" rainfall distribution over inland areas. In August the only useful supplementary falls were confined to the Downs and parts of the Warrego and Maranoa, and a series of inland storms during October and November would be welcome more especially in the very dry Central-West and South-West areas where only slight and patchy temporary benefit would follow the average 30 to 50 point rains of the 1st October.

Temperatures.—Maximum temperatures ranged about normal from 1.1 deg. below at Stanthorpe to 1.7 deg. above at Boulia. Minimum readings were somewhat above normal at Boulia and Longreach (0.8 deg. and 1.0 deg.), otherwise slightly below to 1.9 deg. at Tambo and Stanthorpe.

Frost recorded 19 times at Stanthorpe with lowest minimum readings of 26/19 deg. (6th). Mitchell—8 frosts, 33/27 deg. (2nd), 33/28 deg. (6th); Tambo—9 frosts 32/27 deg. (2nd), 35/26 deg. (6th).

The rain position is summarised below:—

Division.	Normal Mean.	Mean Sept., 1945.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	13	35	169 above
Peninsula South	24	1	96 below
Lower Carpentaria	17	2	88 ,,
Upper Carpentaria	36	Nil	100 ,,
North Coast, Barron	92	23	75 ,,
North Coast, Herbert	155	70	55 ,,
Central Coast, East	108	157	45 above
Central Coast, West	70	26	63 below
Central Highlands	102	71	30 ,,
Central Lowlands	65	7	89 ,,
Upper Western	29	2	93 ,,
Lower Western	44	1	98 ,,
South Coast, Port Curtis	141	251	78 above
South Coast, Moreton	206	239	16 ,,
Darling Downs East	167	118	29 below
Darling Downs West	104	47	55 ,,
Maranoa	118	10	92 ,,
Warrego	88	2	98 ,,
Far South-West	56	2	96 ,,

Commonwealth of Australia, Meteorological Bureau, Brisbane.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

AUGUST RAINFALL.

(Compiled from Telegraphic Reports).

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.	No. of years' records.	Aug., 1944.	Aug., 1945.		Aug.	No. of years' records.	Aug., 1944.	Aug., 1945.
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	0·84	42	1·12	0·72	Gatton College ..	1·08	44	1·79	1·08
Cairns	1·65	61	1·28	0·37	Gayndah	1·12	72	1·29	0·26
Cardwell	1·22	71	1·13	0·16	Gympie	1·65	73	1·26	0·16
Cooktown	1·17	67	0·54	0·47	Kilkivan	1·35	62	0·66	0·17
Herberton	0·61	57	0·47	0·33	Maryborough ..	1·61	72	1·48	0·43
Ingham	1·44	51	1·94	0·67	Nambour	1·88	47	1·80	0·22
Innisfail	4·85	62	6·24	1·24	Nanango	1·29	61	0·78	0·88
Mossman	1·34	19	1·14	0·32	Rockhampton ..	0·82	72	0·90	0·01
Townsville	0·50	72	0·60	Nil	Woodford	1·61	55	1·62	0·51
Central Coast.					*Central Highlands.*				
Ayr	0·58	56	0·66	0·09	Clermont	0·70	72	0·89	Nil
Bowen	0·72	72	0·58	Nil	Springsure	0·99	74	0·46	0·03
Charters Towers ..	0·50	61	1·13	Nil					
Mackay	1·09	72	0·74	0·09	*Darling Downs.*				
Proserpine	1·45	40	2·76	0·78	Dalby	1·16	73	1·90	1·34
St. Lawrence ..	0·79	72	1·12	0·48	Emu Vale	1·06	47	2·74	1·26
					Jimbour	1·10	64	2·02	0·82
South Coast.					Miles	1·08	58	2·01	1·53
Biggenden	1·04	44	0·93	0·04	Stanthorpe	1·73	70	1·95	2·85
Bundaberg	1·27	60	1·61	Nil	Toowoomba	1·58	71	3·24	1·52
Brisbane Bureau ..	1·90	93	2·51	0·87	Warwick	1·40	78	3·65	2·28
Caboolture	1·62	67	1·63	0·42					
Childers	1·21	48	0·96	0·03	*Maranoa.*				
Crohamhurst	2·17	50	1·77	0·50	Roma	0·86	69	2·74	0·76
Esk	1·39	56	1·58	0·48	St. George	0·91	62	2·86	1·11

CLIMATOLOGICAL TABLE FOR AUGUST.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	82	65	86	23, 24	55	24	0·37	5
Herberton	..	75	51	87	11	43	11, 12	0·33	6
Townsville	..	79	60	85	23, 24	55	5, 14	Nil	..
Brisbane	30·11	72	52	79	17	43	3	0·87	5
Darling Downs.									
Dalby	..	70	44	83	27	32	2, 15	1·34	4
Stanthorpe	..	62	38	73	27	27	15	2·85	10
Toowoomba	..	65	43	76	25	30	15	1·52	5
Mid-Interior.									
Georgetown	30·01	93	57	97	28	50	24	Nil	..
Longreach	30·11	79	52	96	26	37	2	Nil	..
Mitchell	30·14	71	43	85	27	29	2	1·46	4
Western.									
Burketown	..	88	60	95	23	54	14	Nil	..
Boulia	30·03	83	54	97	24, 27	43	2, 3	0·02	1
Thargomindah	30·08	73	49	94	24	37	2	0·14	1

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Commonwealth of Australia,
Meteorological Bureau, Brisbane.